Seeing "20/20" about 2010 Marine Corps Comms

2 November 1999
1999 NDIA Expeditionary Warfare Conference

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Marine Corps Combat Development Command
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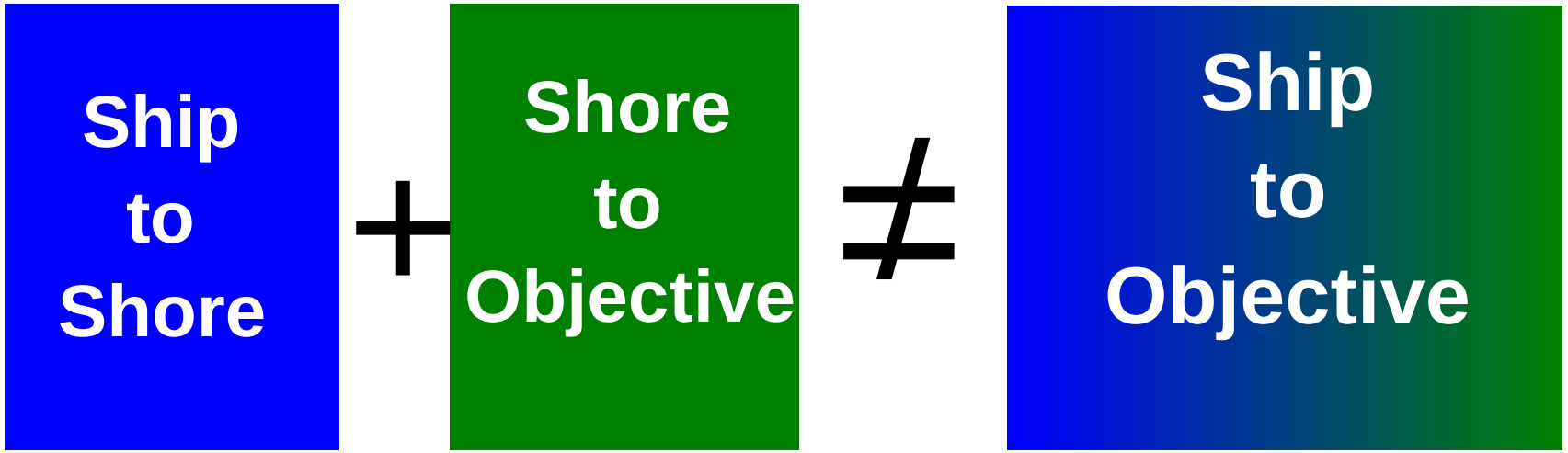
USMC Capstone Warfighting Concept
4 January 1996

Concept Based Requirements Process (CBRP)

OPERATIONAL MANEUVER FROM THE SEA (OMFTS)

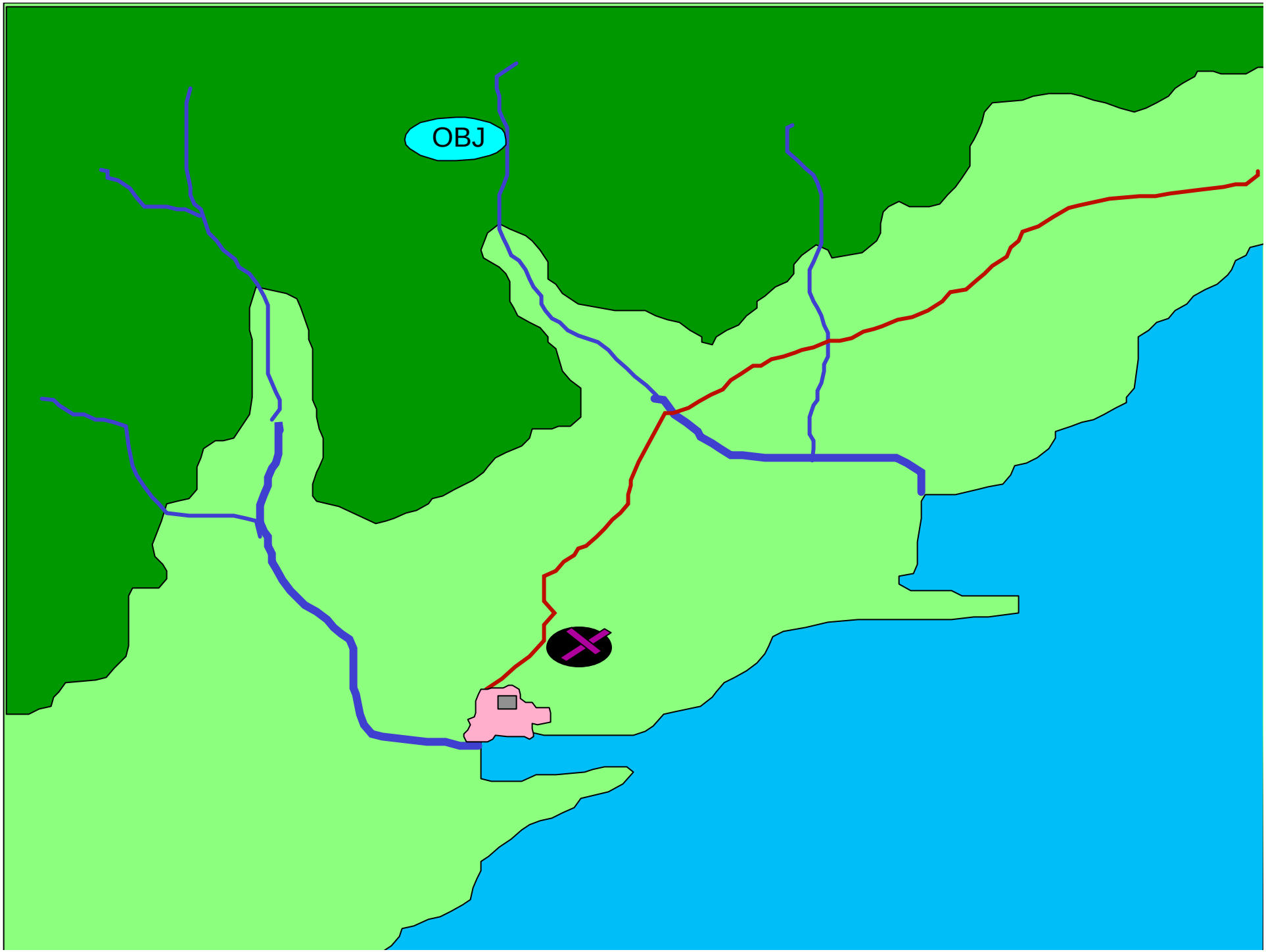
Ship to Objective Maneuver (STOM)
Sustained Operations Ashore (SOA)
Other Expeditionary Operations (OEO)

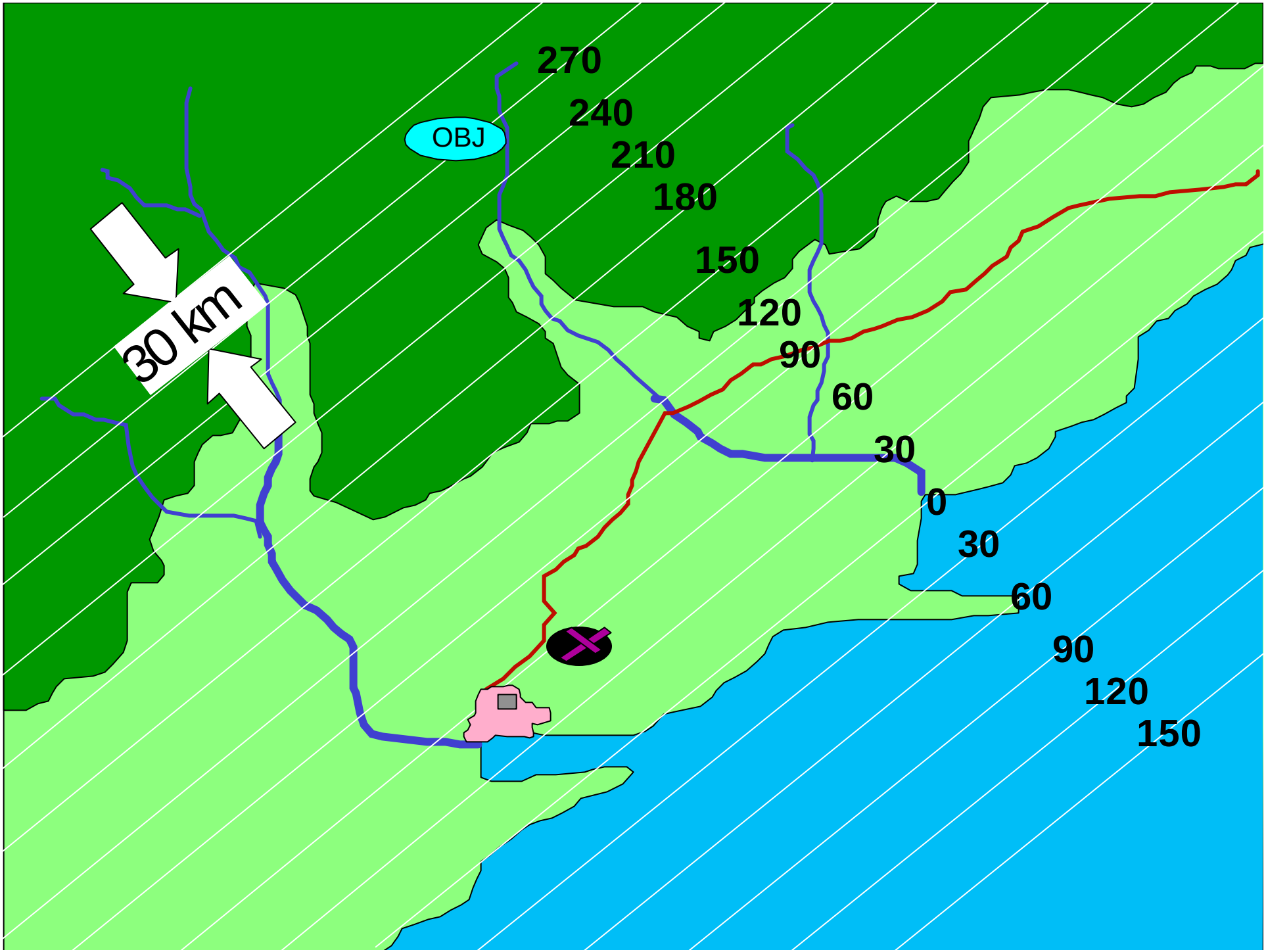
New Math for OMFTS

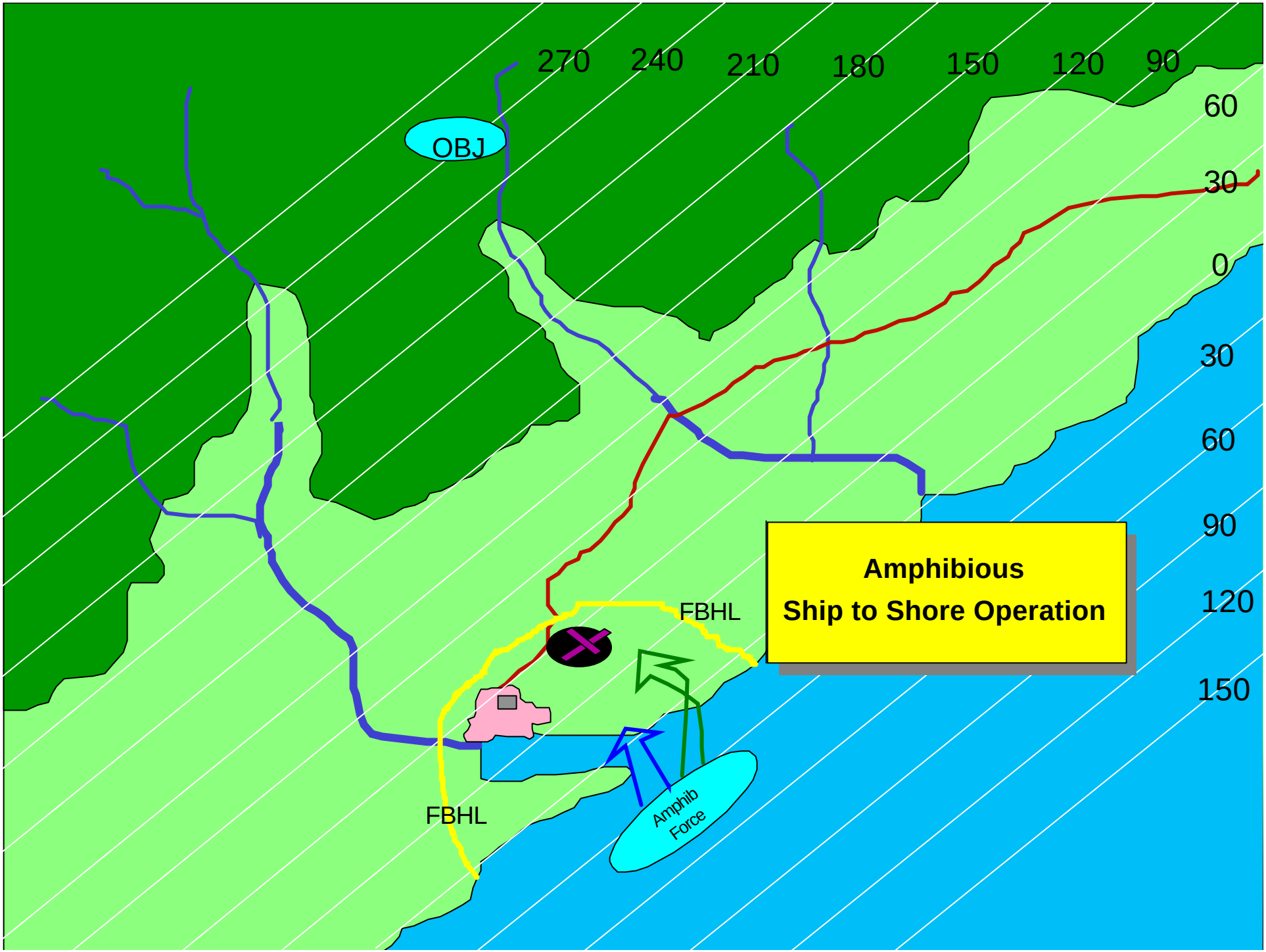


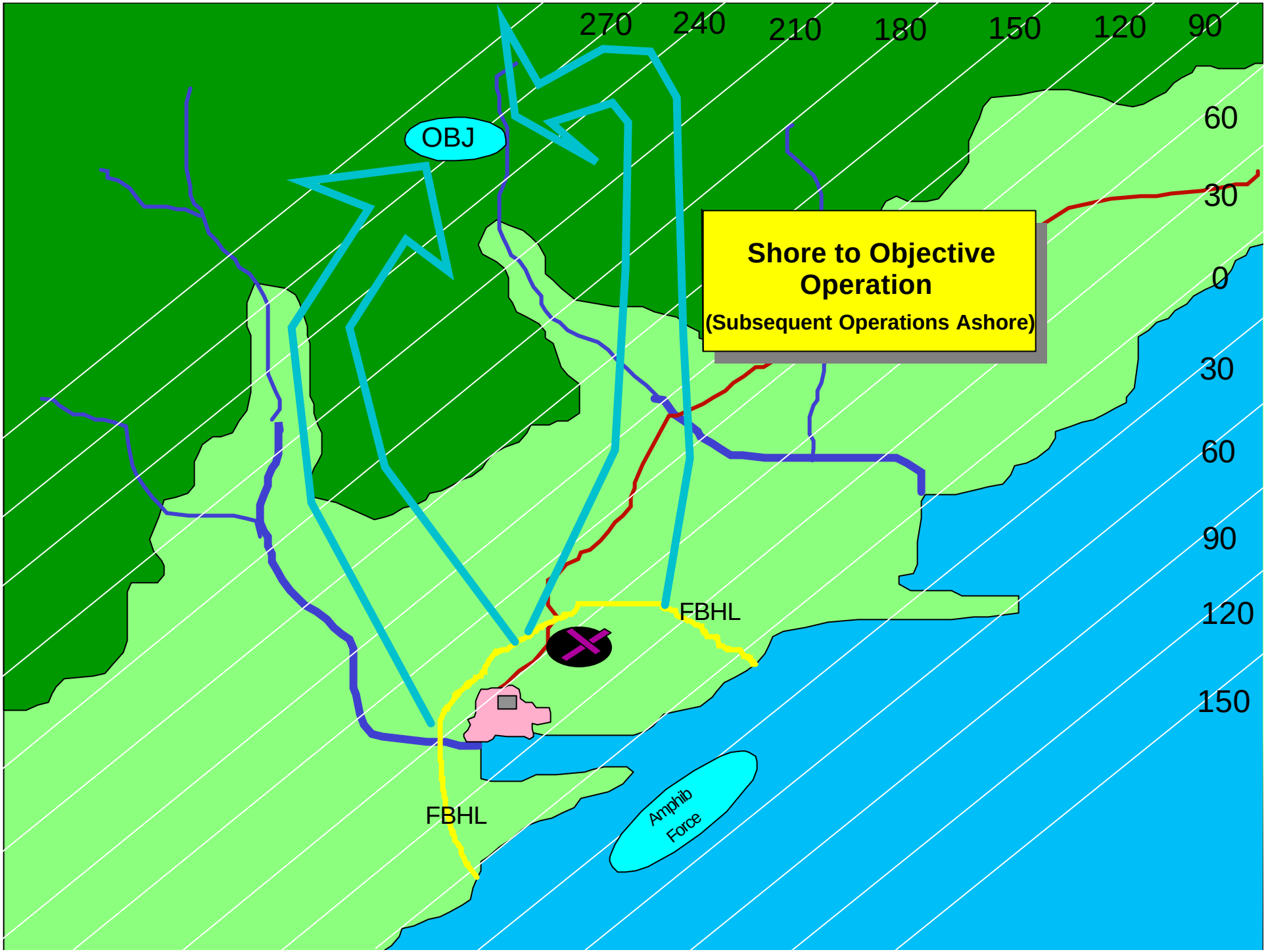
"The command and control system best suited to OMFTS will be very different from those developed to deal with previous approaches to amphibious warfare."

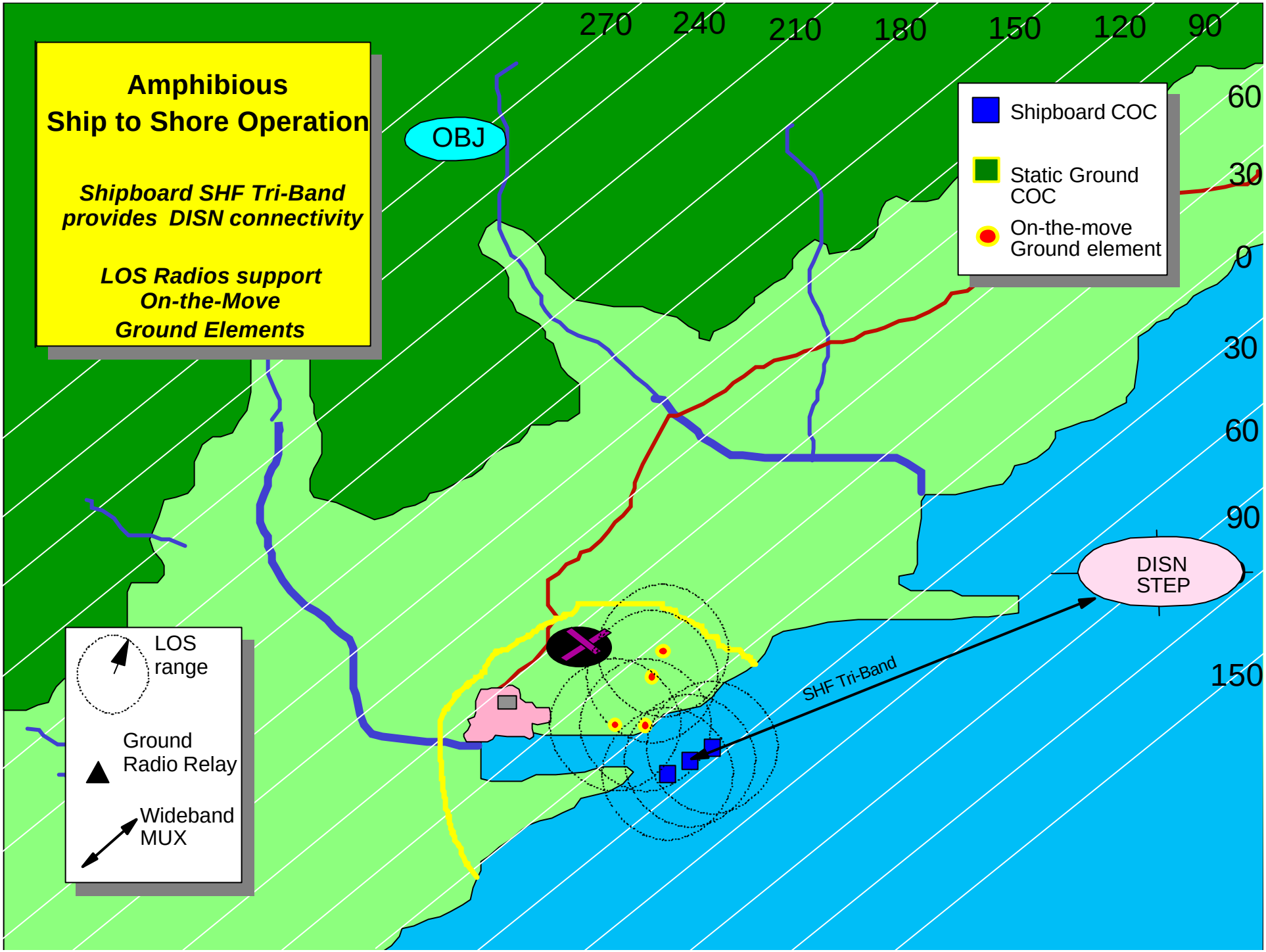
OMFTS Concept, 4 Jan 1996


OBJ


270
240
210
180
150
120
90
60
30
0
30
60
90
120
150
OBJ
30 km


270
240
210
180
150
120
90
60
30
0
30
60
90
120
150
OBJ
FBHL
FBHL
Amphib Force
Amphibious
Ship to Shore Operation

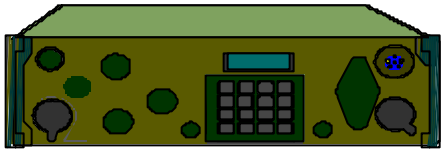

270
240
210
180
150
120
90
60
30
0
30
60
90
120
150
OBJ
Shore to Objective Operation
(Subsequent Operations Ashore)
FBHL
FBHL
Amphib Force


Amphibious
Ship to Shore Operation
Shipboard SHF Tri-Band provides DISN connectivity
LOS Radios support On-the-Move Ground Elements
OBJ
Shipboard COC
Static Ground COC
On-the-move Ground element
DISN STEP
SHF Tri-Band
LOS range
Ground Radio Relay
Wideband MUX
270
240
210
180
150
120
90
60
30
0
30
60
90
150

On-the-Move LOS Radios

VHF Radio

SINCGARS



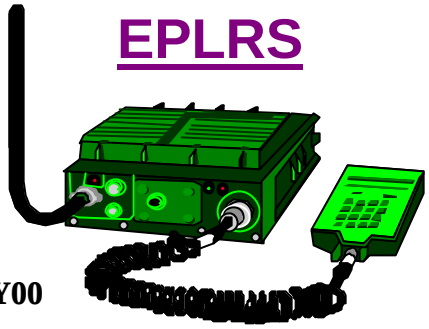
1,500 bps

Being Fielded

Netted Voice & Joint Variable Message Format (JVMF)
C2 & SA msg exchange via MIL-STD-188-220 (IP over CNR)

UHF
Data Radio

EPLRS

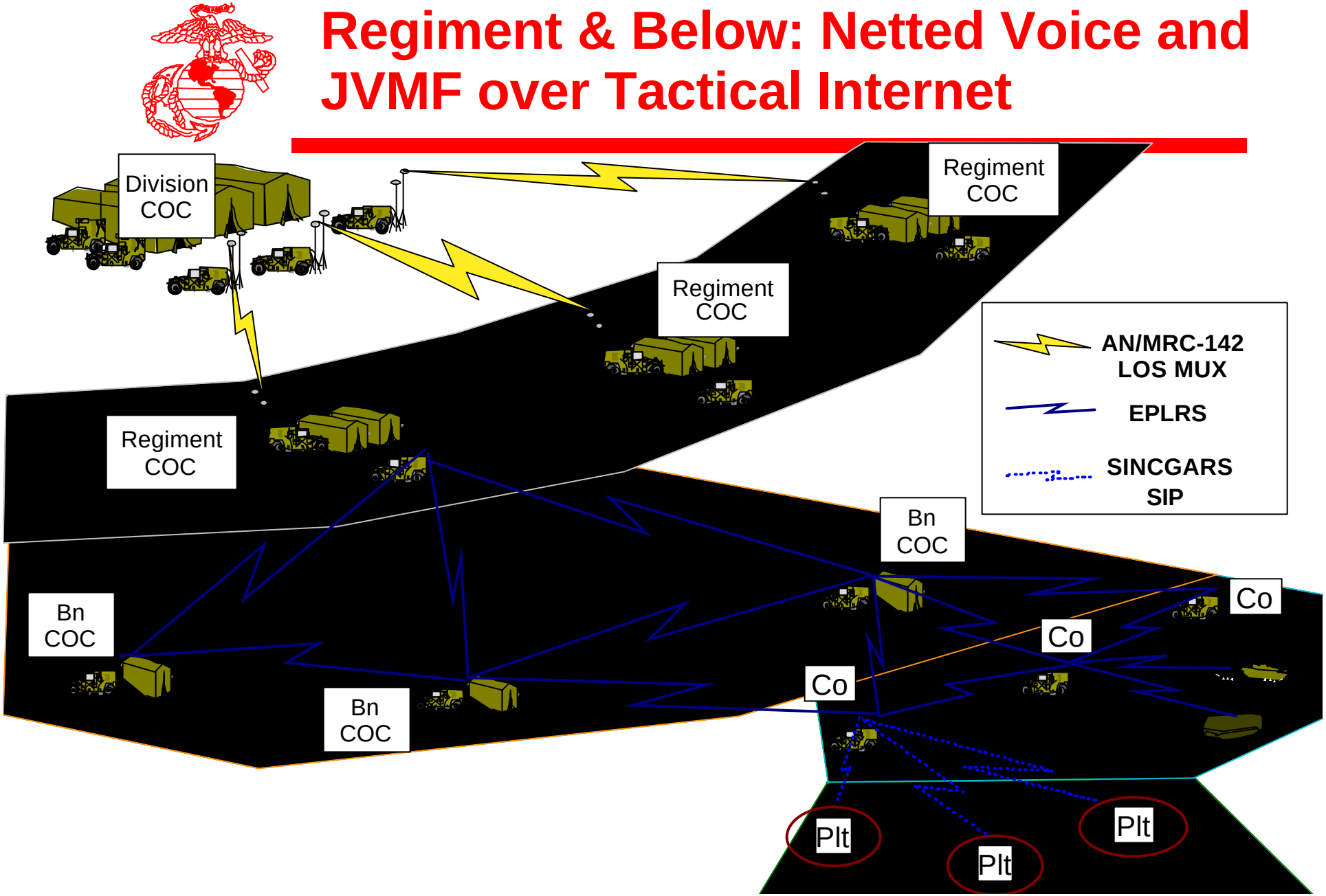


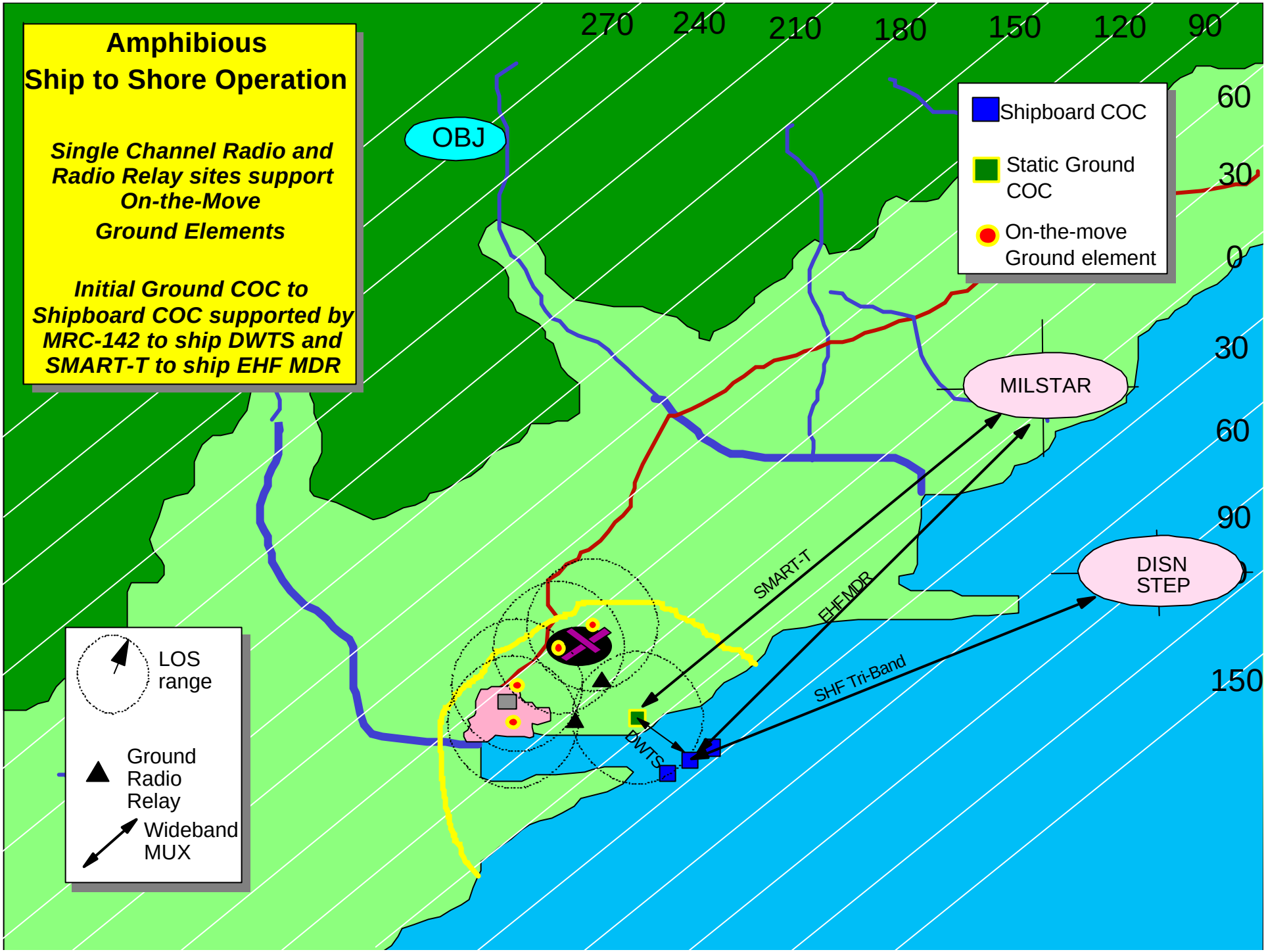
IOC FY00

480 bps
to
115,000 bps

Joint Variable Message Format (JVMF)
C2 and SA msg via pt-to-pt and broadcast needlines

Regiment & Below: Netted Voice and JVMF over Tactical Internet




Amphibious
Ship to Shore Operation
Single Channel Radio and Radio Relay sites support On-the-Move Ground Elements
Initial Ground COC to Shipboard COC supported by MRC-142 to ship DWTS and SMART-T to ship EHF MDR
270
240
210
180
150
120
90
60
30
0
30
60
90
150
OBJ
Shipboard COC
Static Ground COC
On-the-move Ground element
MILSTAR
DISN STEP
SMART-T
EHF MDR
SHF Tri-Band
DWTS
LOS range
Ground Radio Relay
Wideband MUX

Initial Wideband Ship-to-Shore

UHF LOS MUX

AN/MRC-142

Fielded

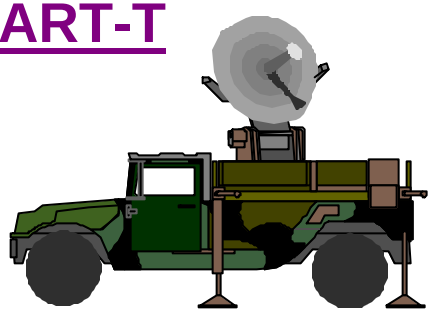
576,000 bps

(at Div Comm Co)

Compatible with Shipboard Digital Wideband Transmission System (DWTS)

EHF SATCOM (MILSTAR)

SMART-T

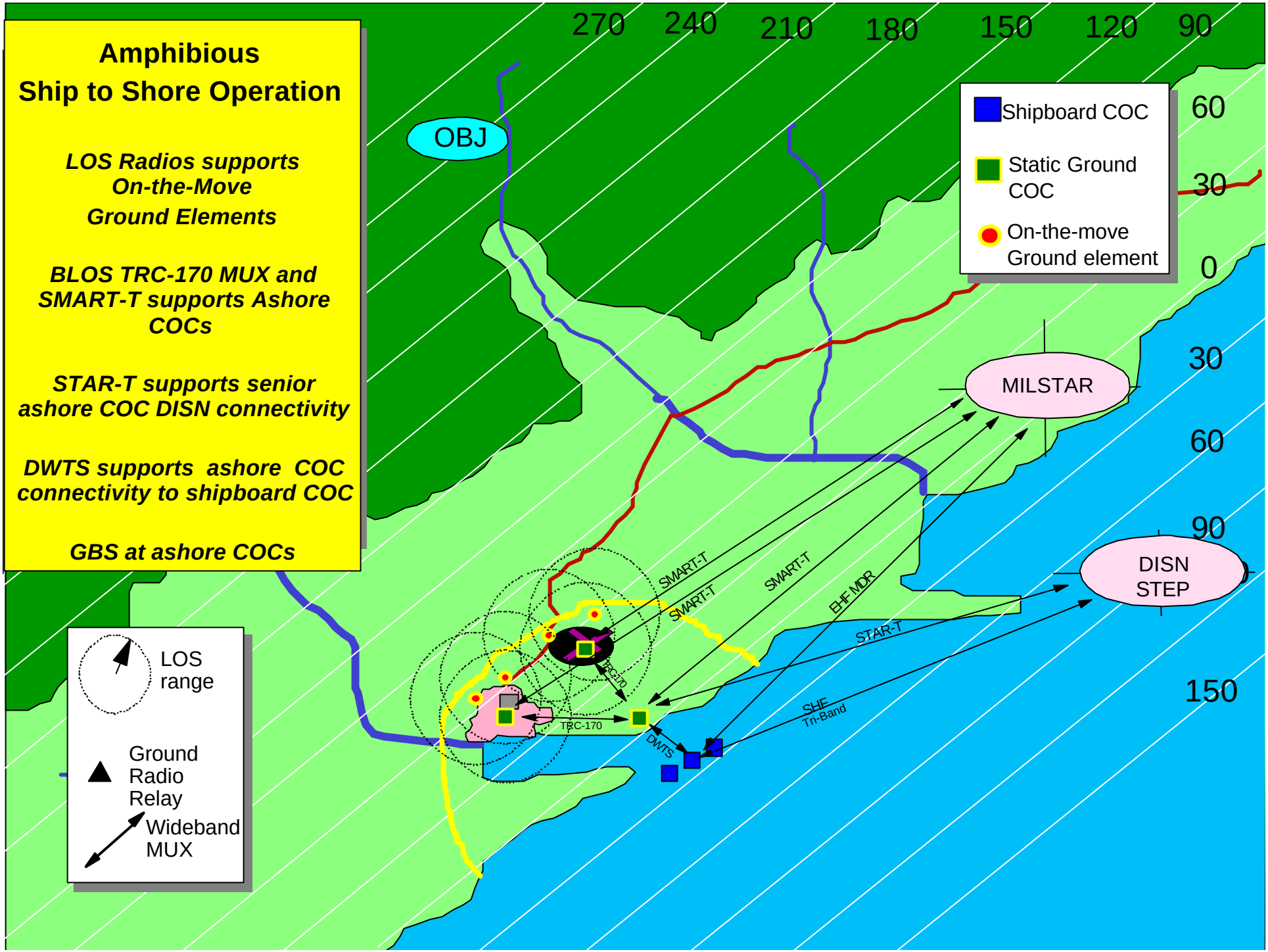


IOC FY00

1,544,000 bps

(at Div & Inf Reg)

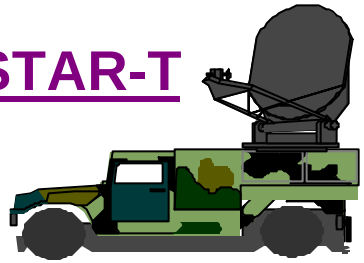
Compatible with Shipboard EHF MDR


Amphibious
Ship to Shore Operation
LOS Radios supports On-the-Move Ground Elements
BLOS TRC-170 MUX and SMART-T supports Ashore COCs
STAR-T supports senior ashore COC DISN connectivity
DWTS supports ashore COC connectivity to shipboard COC
GBS at ashore COCs
OBJ
MILSTAR
DISN STEP
Shipboard COC
Static Ground COC
On-the-move Ground element
LOS range
Ground Radio Relay
Wideband MUX
SMART-T
SMART-T
SMART-T
EHF MDR
STAR-T
SHF Tri-Band
TRC-170
TRC-170
DWTS
270
240
210
180
150
120
90
60
30
0
30
60
90
150

Wideband for Major Ashore COCs

SHF SATCOM
(Comm & Mil Bands)

STAR-T

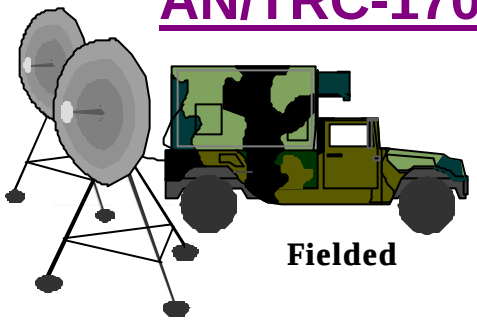


IOC FY99

8,192,000 bps
(at Comm Bn)

SHF BLOS MUX

AN/TRC-170(V)5

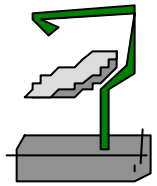


Fielded

4,608,000 bps
(at Comm Bn)

Ku Band
SatCom

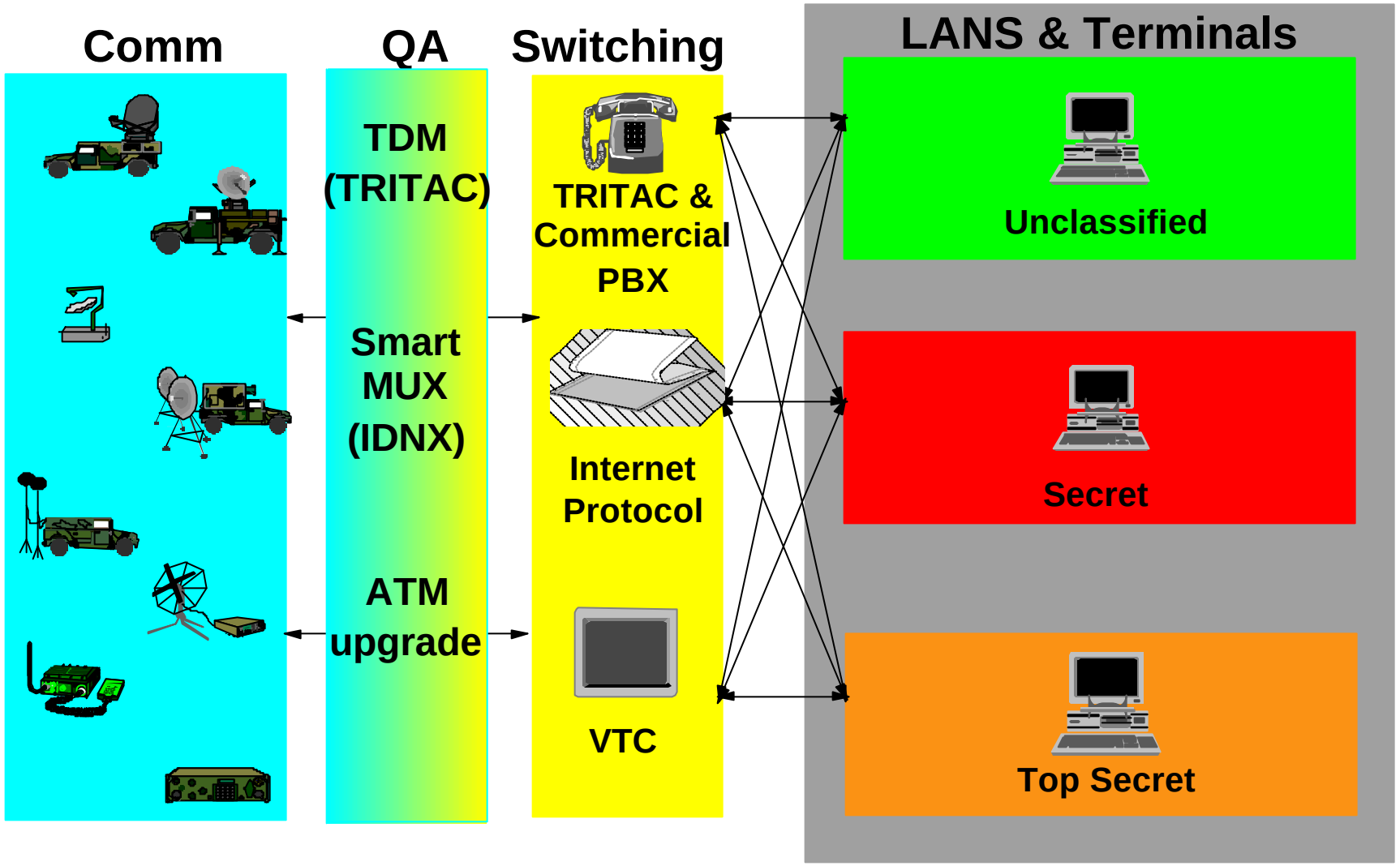
GBS

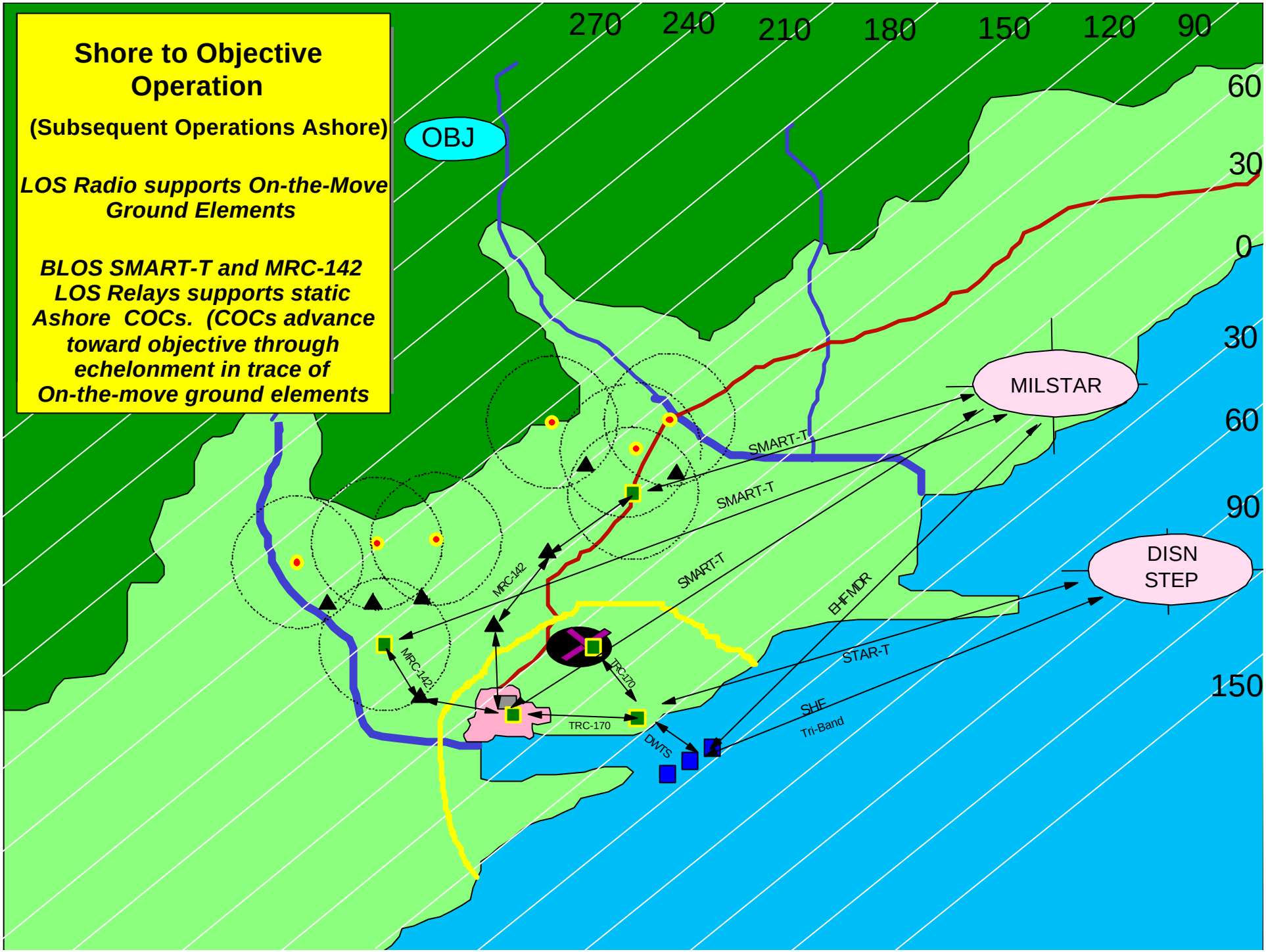


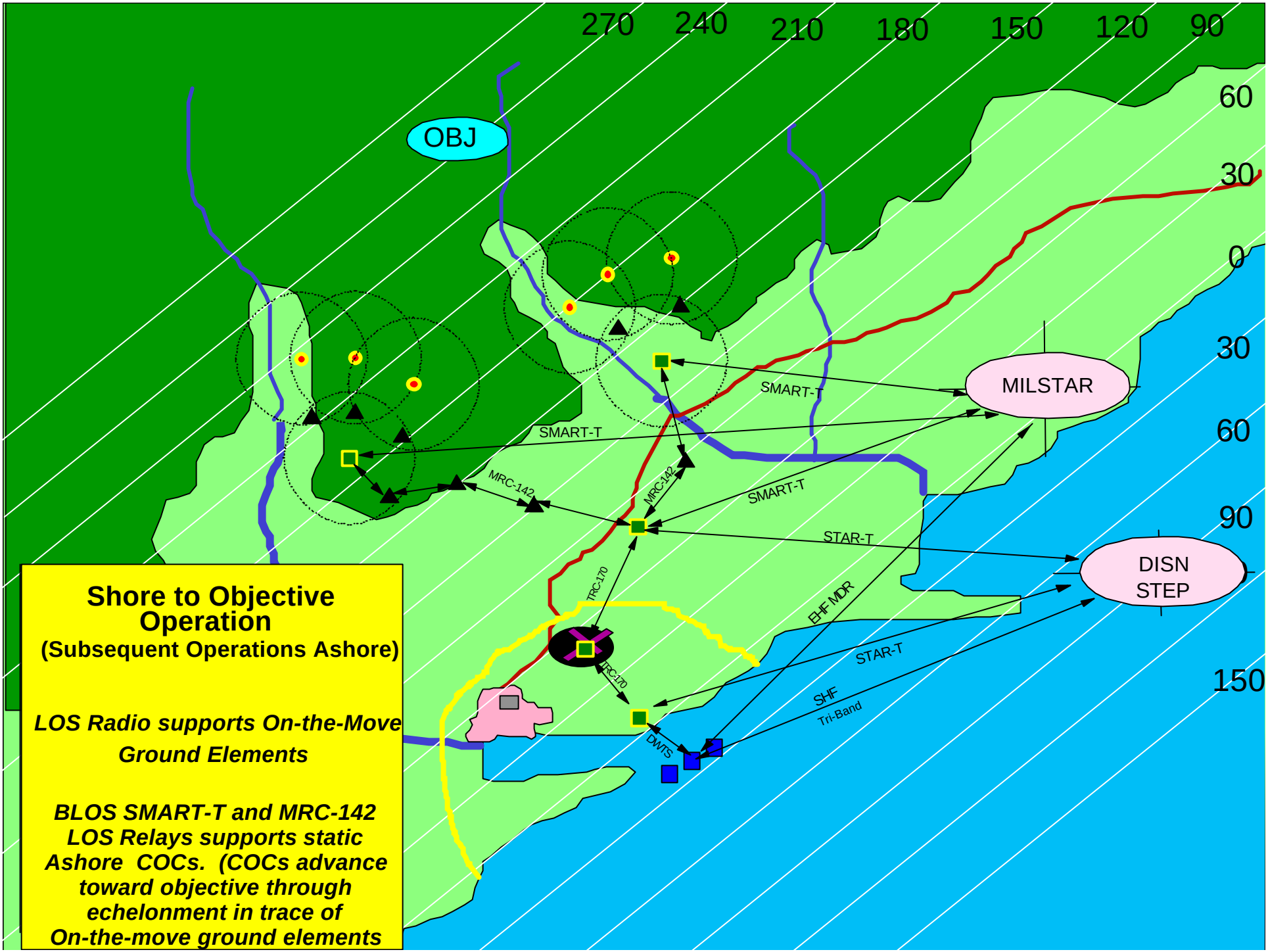
IOC FY00

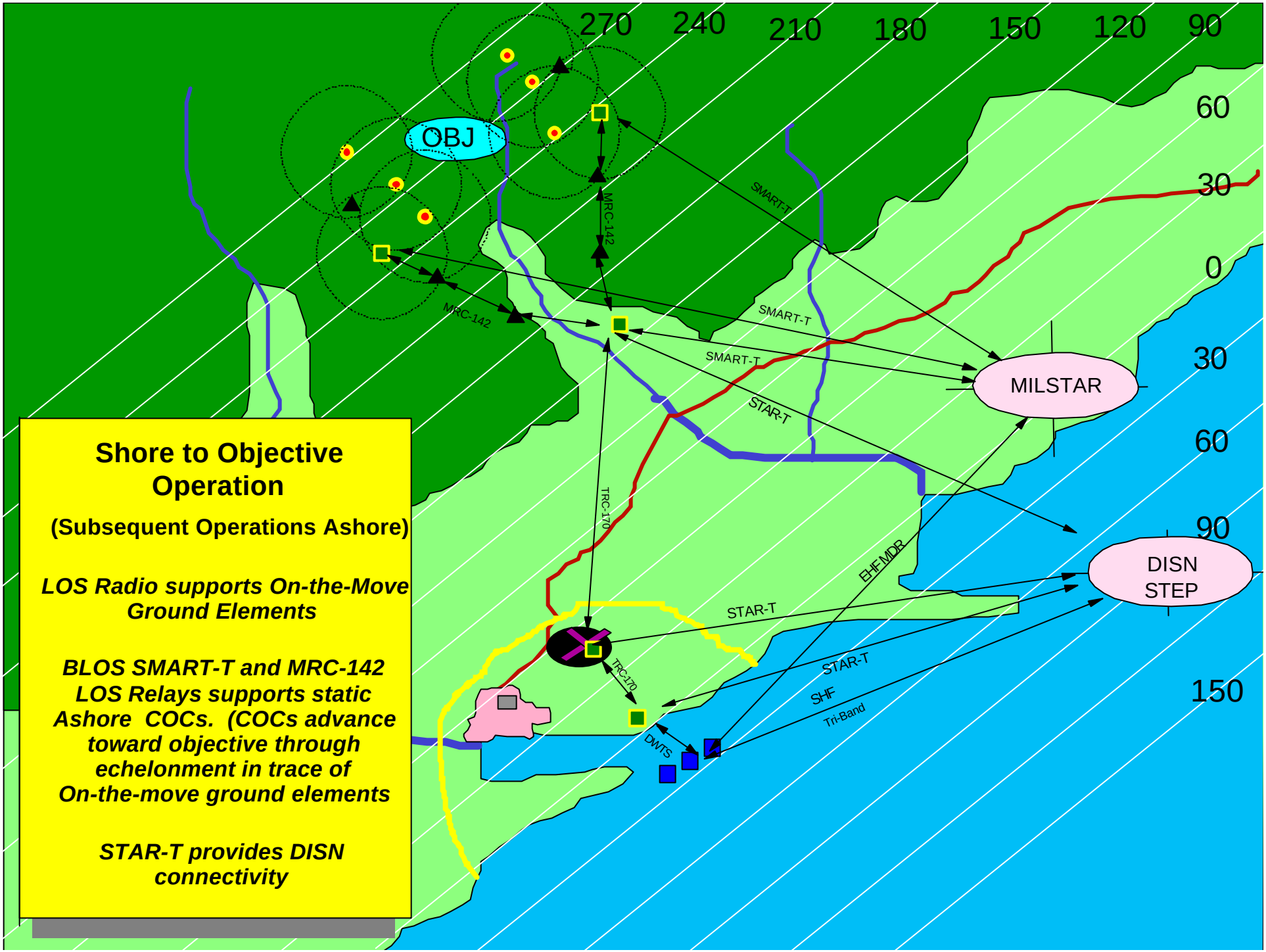
23,000,000 bps
broadcast
(at Div & Reg)

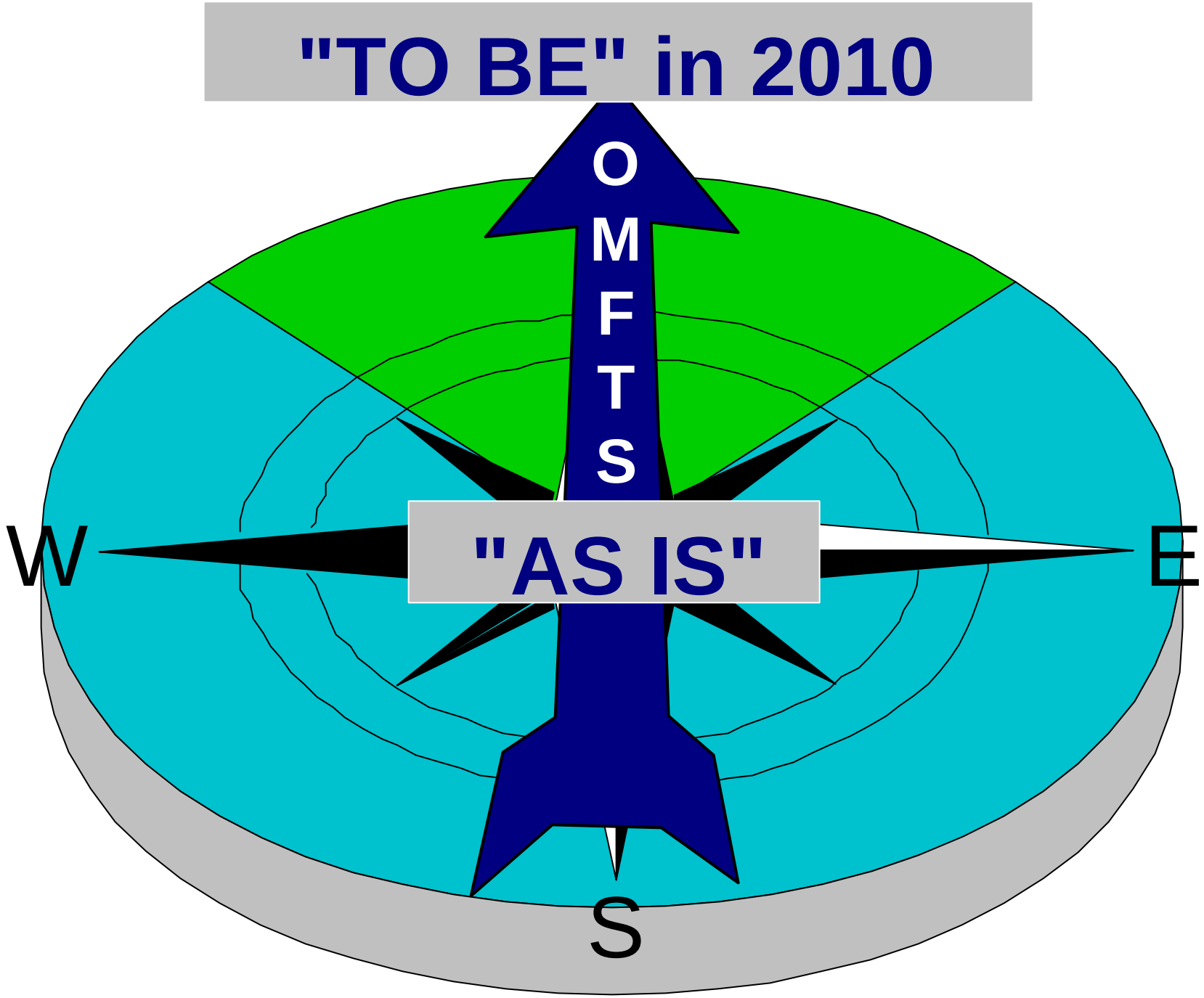
A Functional Combat Opertions Center (COC) Layout

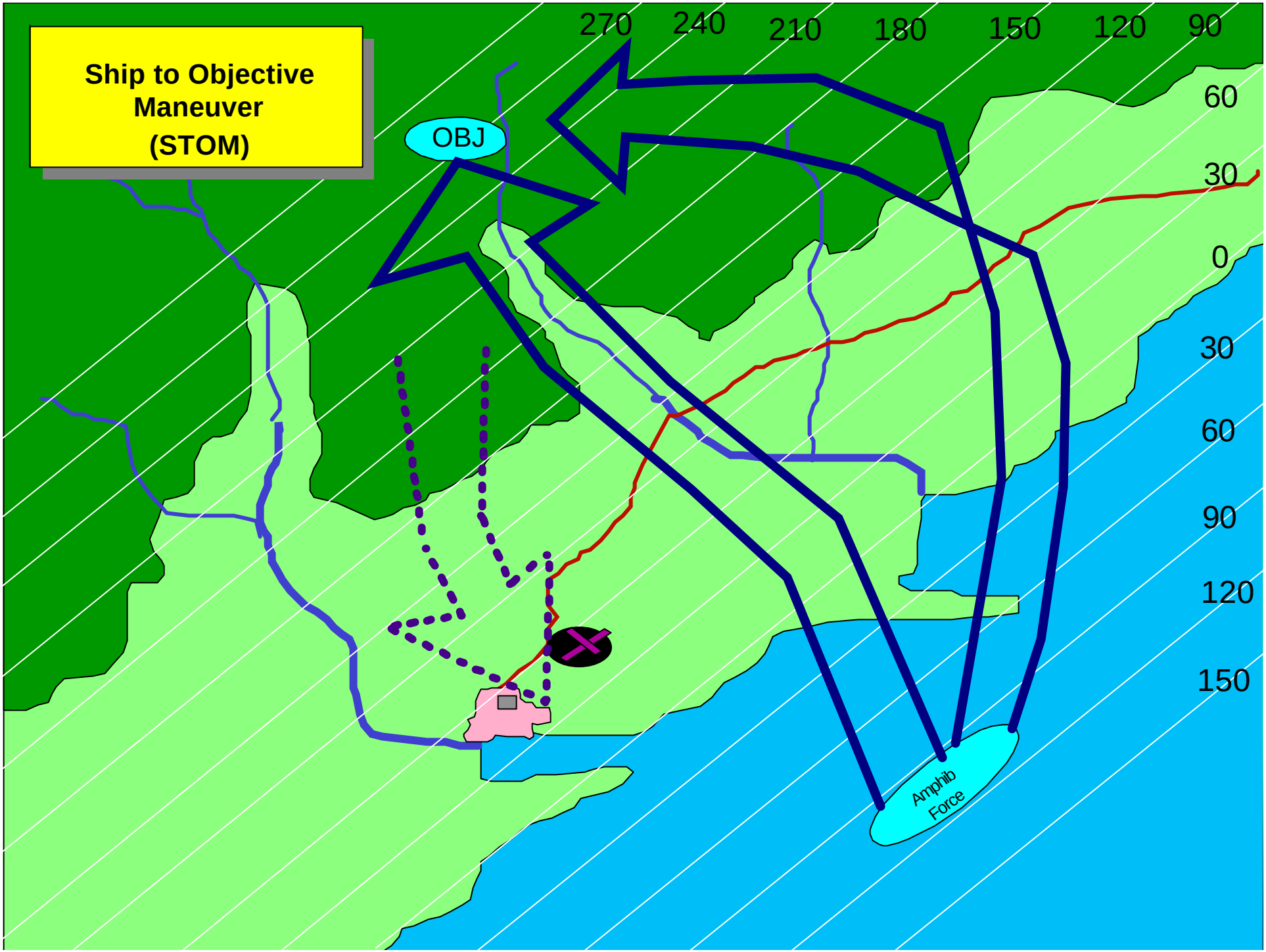



Shore to Objective Operation
(Subsequent Operations Ashore)
LOS Radio supports On-the-Move Ground Elements
BLOS SMART-T and MRC-142 LOS Relays supports static Ashore COCs. (COCs advance toward objective through echelonment in trace of On-the-move ground elements
270
240
210
180
150
120
90
60
30
0
30
60
90
150
OBJ
MILSTAR
DISN STEP
SMART-T
SMART-T
SMART-T
MRC-142
MRC-142
TRC-170
TRC-170
TRC-170
EHF MDR
STAR-T
SHF Tri-Band
DWTS

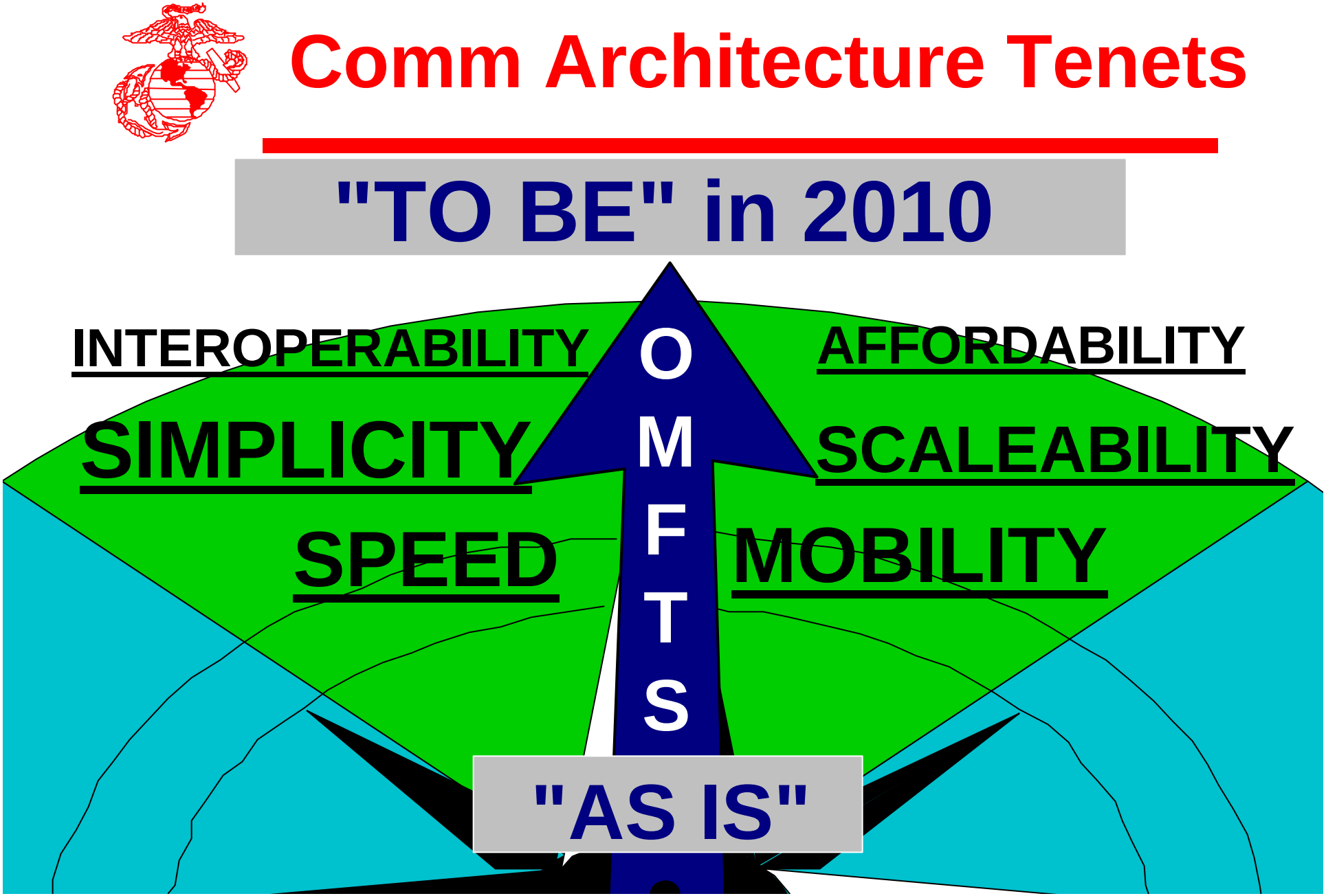

270
240
210
180
150
120
90
60
30
0
30
60
90
150
OBJ
MILSTAR
DISN
STEP
SMART-T
SMART-T
SMART-T
MRC-142
MRC-142
STAR-T
TRC-170
TRC-170
EHF MDR
STAR-T
SHF
Tri-Band
DWTS
Shore to Objective Operation
(Subsequent Operations Ashore)
LOS Radio supports On-the-Move Ground Elements
BLOS SMART-T and MRC-142 LOS Relays supports static Ashore COCs. (COCs advance toward objective through echelonment in trace of On-the-move ground elements

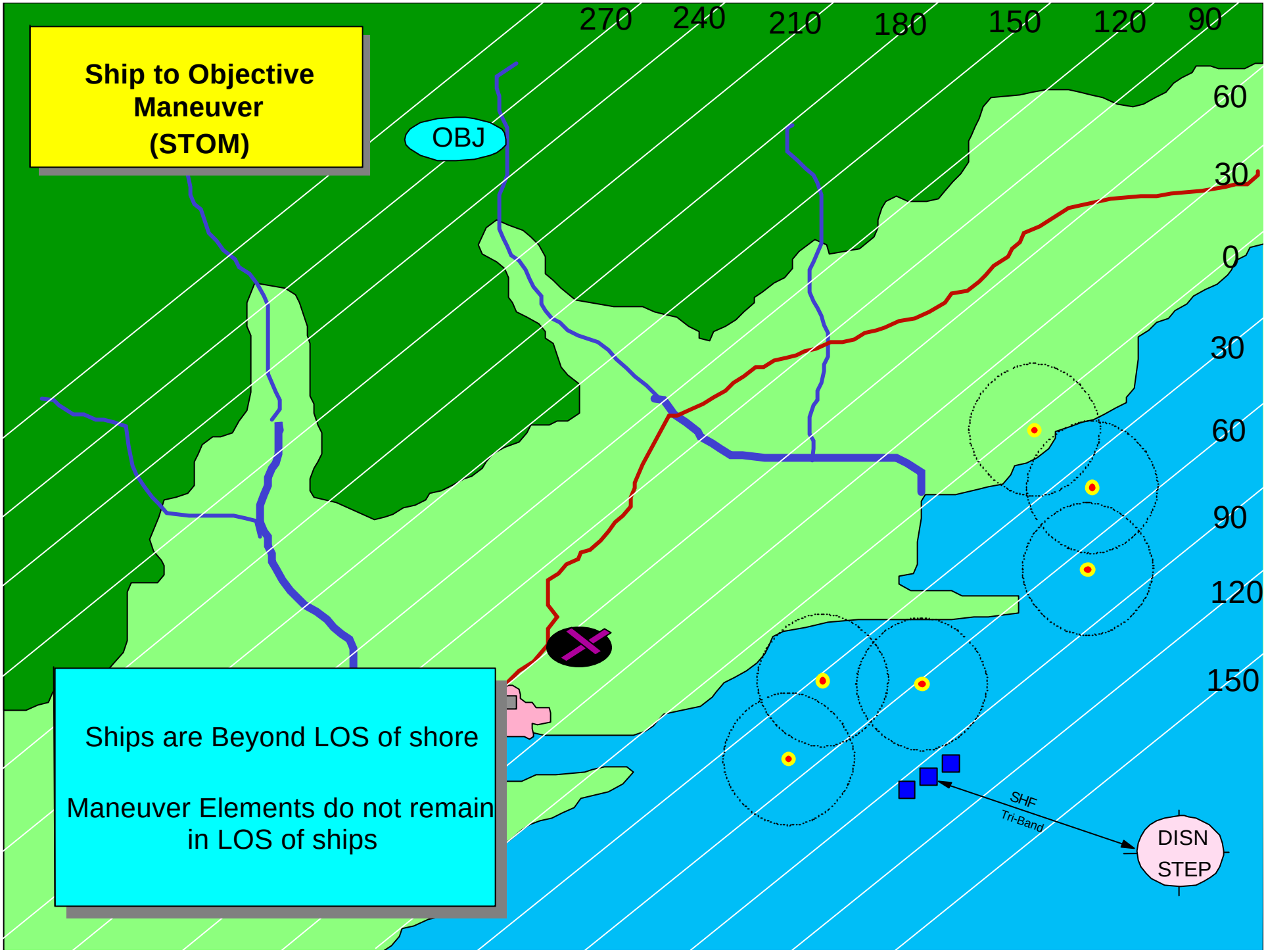

270
240
210
180
150
120
90
60
30
0
30
60
90
150
OBJ
MRC-142
MRC-142
SMART-T
SMART-T
SMART-T
STAR-T
MILSTAR
TRC-170
TRC-170
EHFMDR
DISN
STEP
STAR-T
STAR-T
SHF
Tri-Band
DWTS
Shore to Objective Operation
(Subsequent Operations Ashore)
LOS Radio supports On-the-Move Ground Elements
BLOS SMART-T and MRC-142 LOS Relays supports static Ashore COCs. (COCs advance toward objective through echelonment in trace of On-the-move ground elements
STAR-T provides DISN connectivity

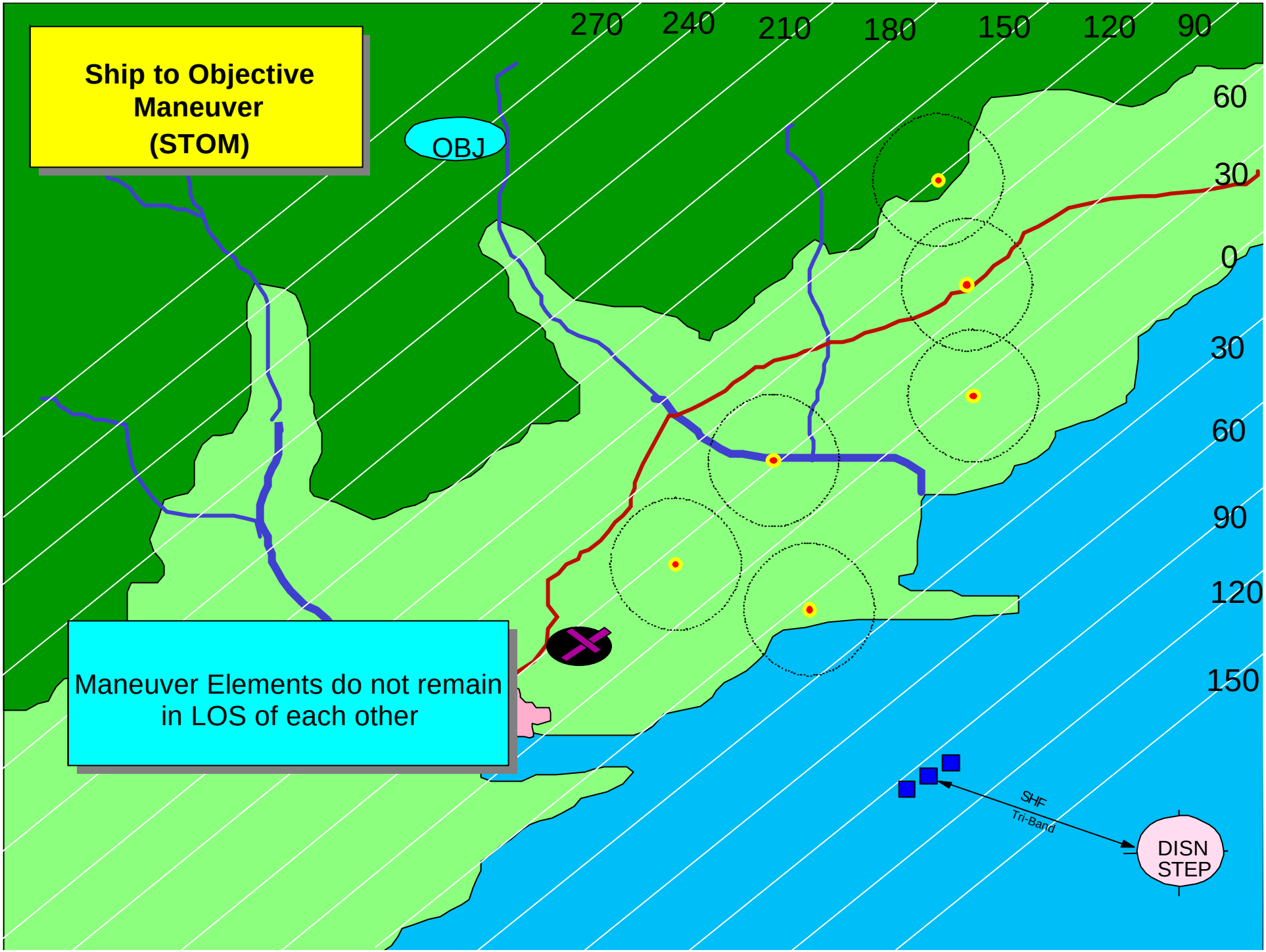

"TO BE" in 2010
O
M
F
T
S
"AS IS"
W
E
S

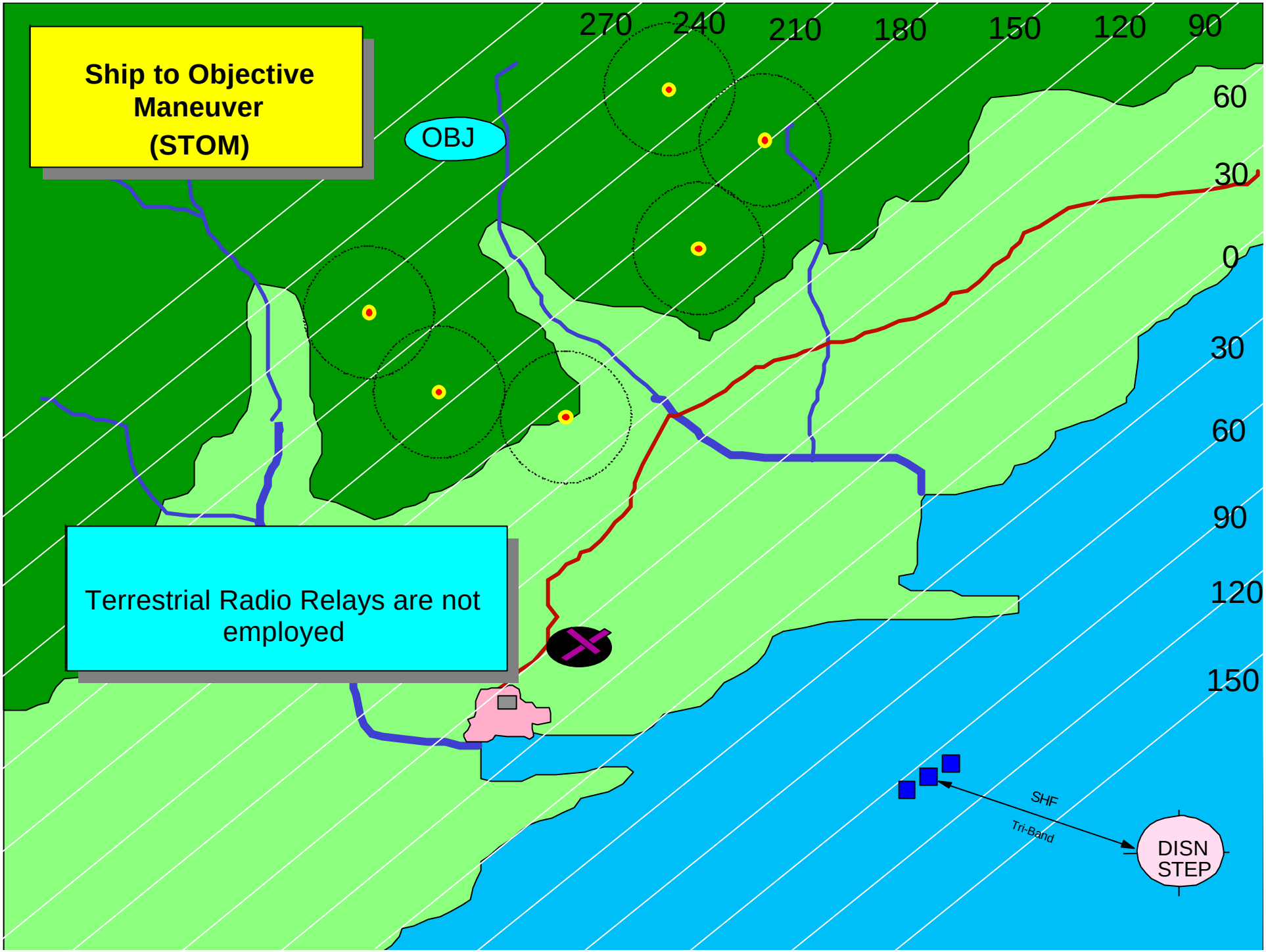

Ship to Objective Maneuver (STOM)
OBJ
270
240
210
180
150
120
90
60
30
0
30
60
90
120
150
Amphib Force

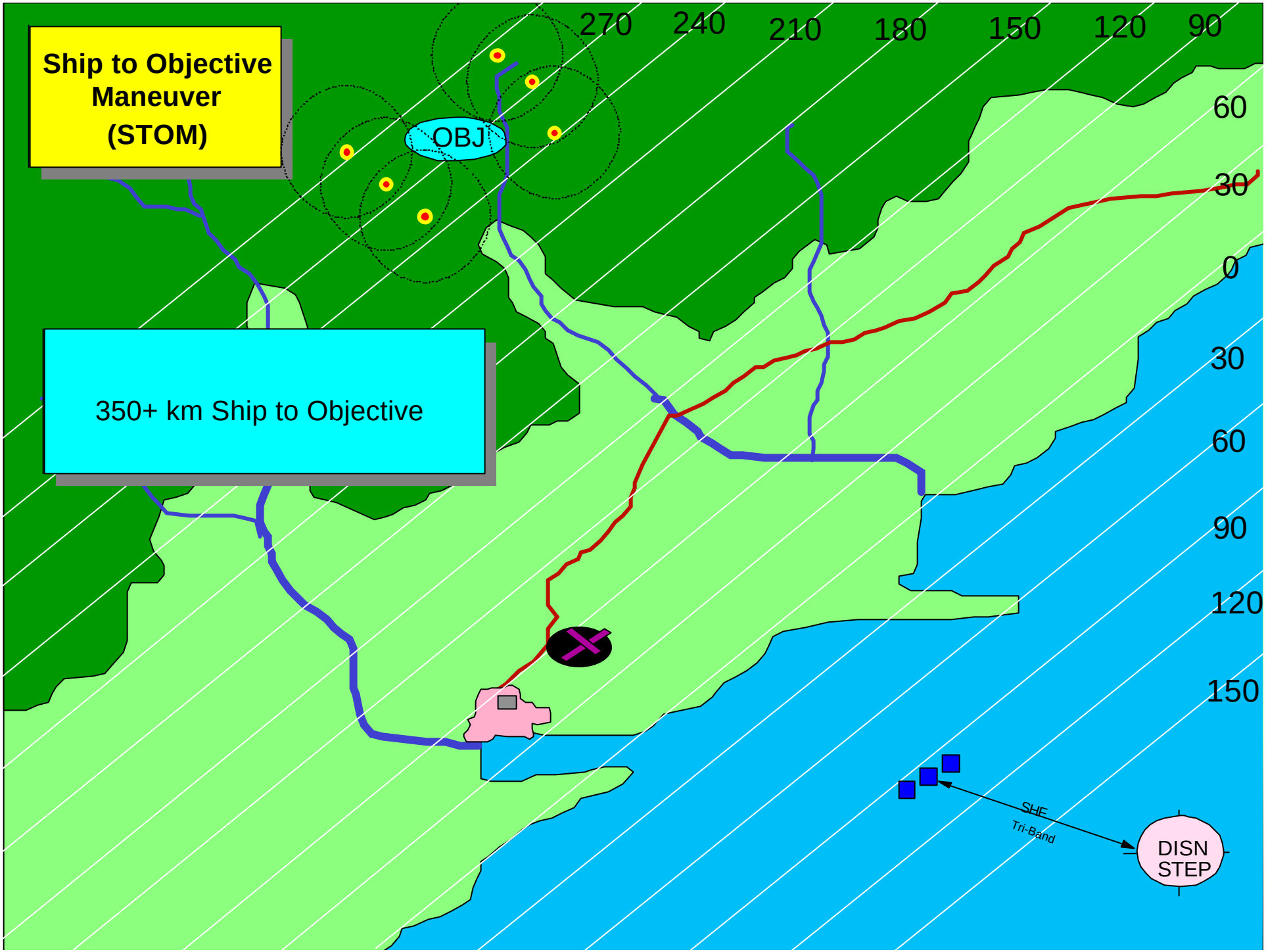
Comm Architecture Tenets

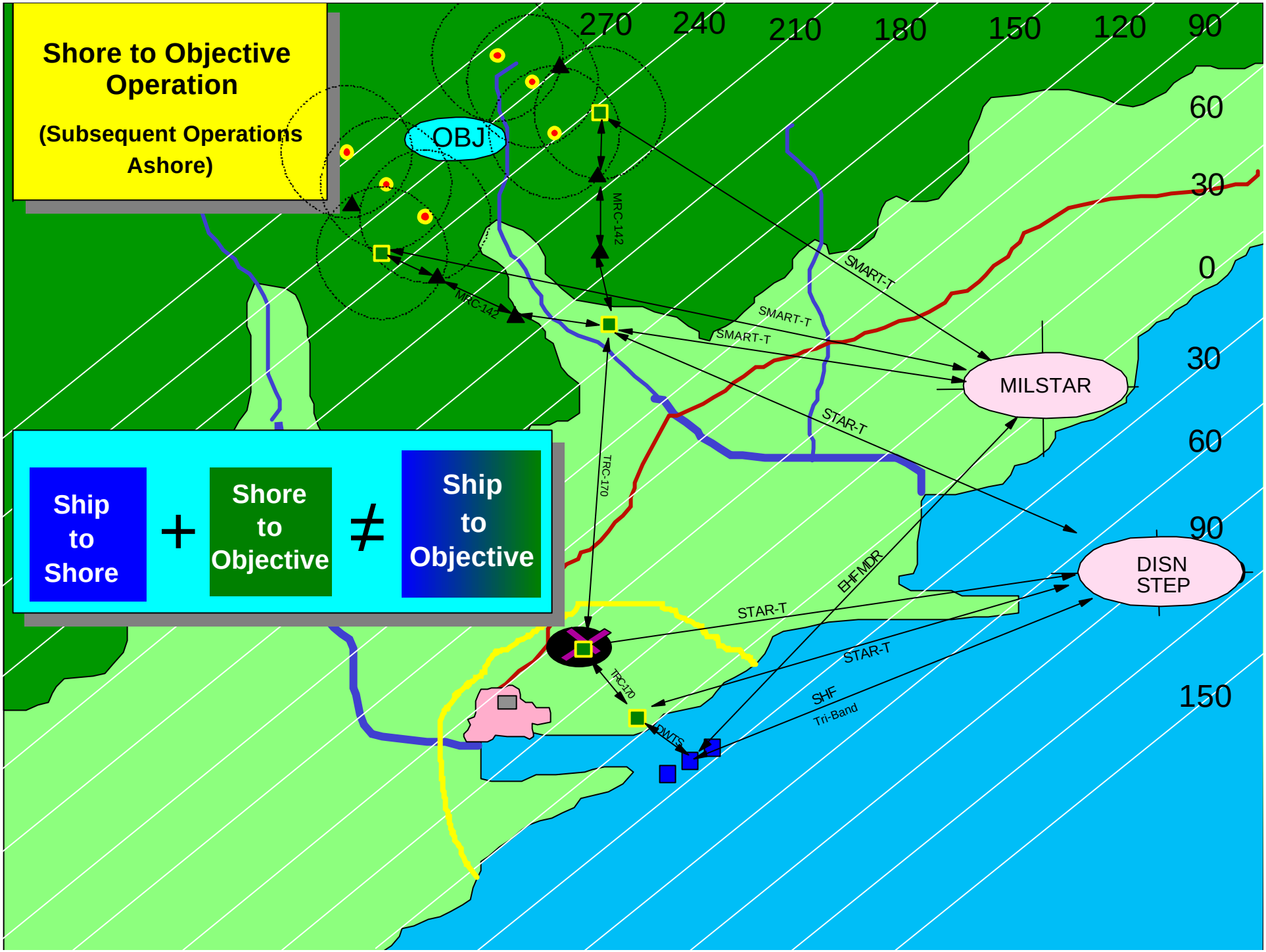



Ship to Objective Maneuver (STOM)
OBJ
270
240
210
180
150
120
90
60
30
0
30
60
90
120
150
Ships are Beyond LOS of shore
Maneuver Elements do not remain in LOS of ships
SHF
Tri-Band
DISN
STEP


Ship to Objective Maneuver (STOM)
OBJ
270
240
210
180
150
120
90
60
30
0
30
60
90
120
150
Maneuver Elements do not remain in LOS of each other
SHF Tri-Band
DISN STEP

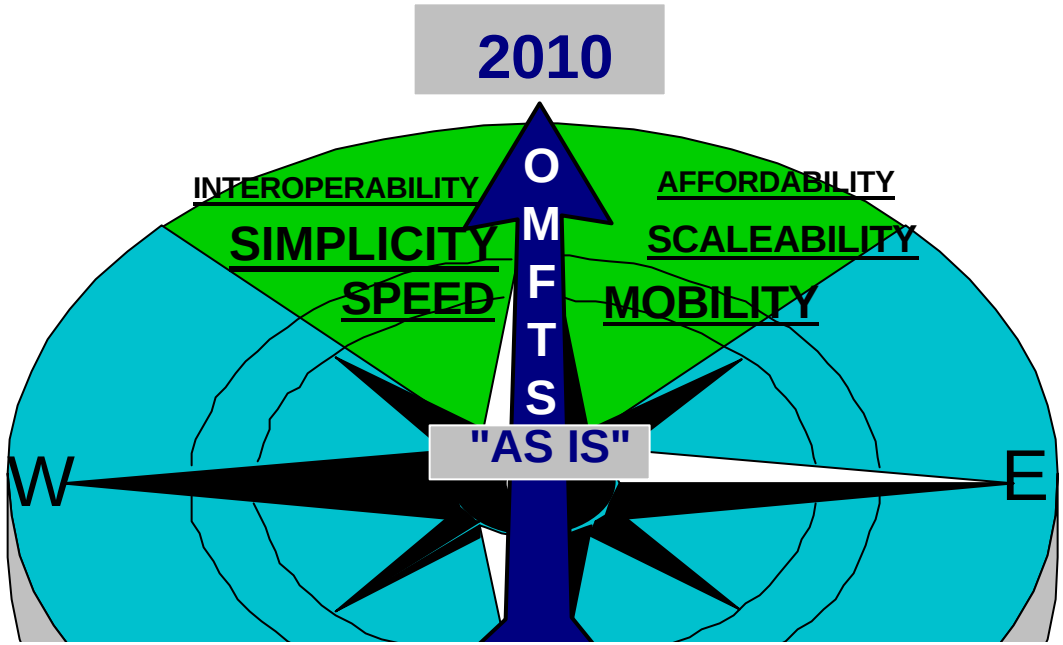

Ship to Objective Maneuver (STOM)
OBJ
Terrestrial Radio Relays are not employed
270
240
210
180
150
120
90
60
30
0
30
60
90
120
150
SHF
Tri-Band
DISN STEP

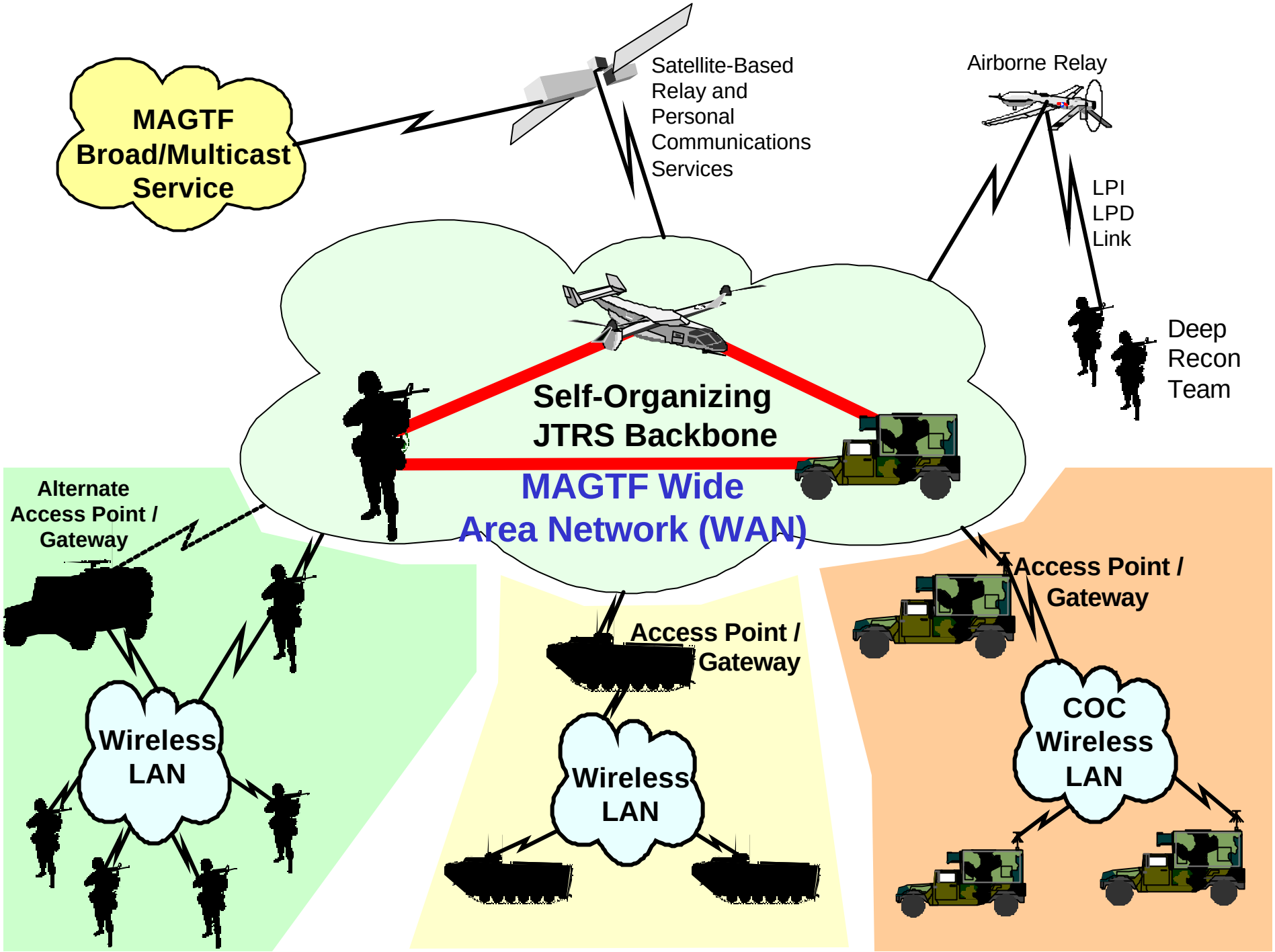

Ship to Objective Maneuver (STOM)
OBJ
350+ km Ship to Objective
270
240
210
180
150
120
90
60
30
0
30
60
90
120
150
SHF
Tri-Band
DISN
STEP

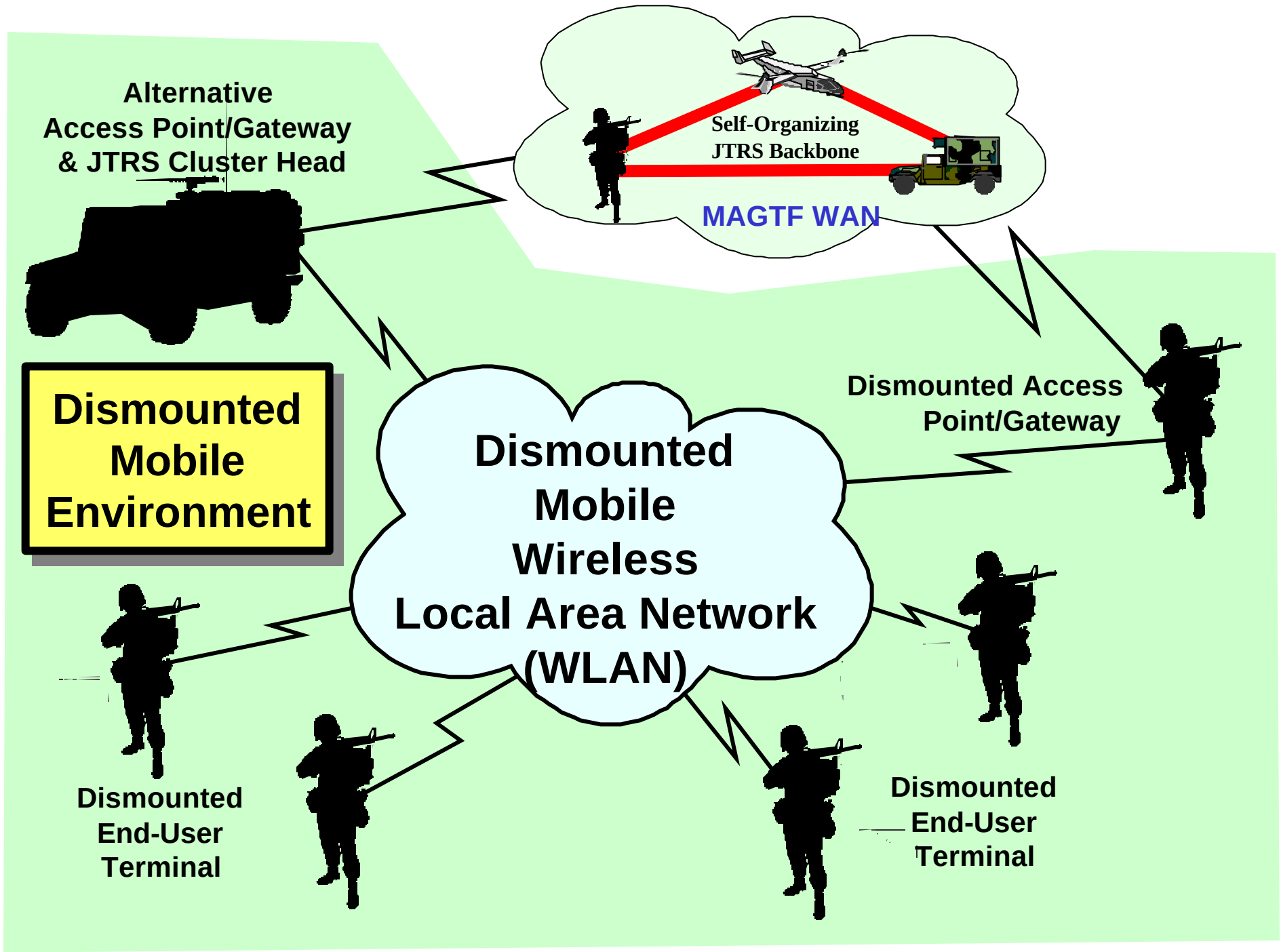

Shore to Objective Operation
(Subsequent Operations Ashore)
OBJ
MRC-142
MRC-142
SMART-T
SMART-T
SMART-T
MILSTAR
STAR-T
TRC-170
EHF MDR
DISN STEP
STAR-T
STAR-T
TRC-170
SHF
Tri-Band
DWTS
Ship to Shore
+
Shore to Objective
≠
Ship to Objective
270
240
210
180
150
120
90
60
30
0
30
60
90
150

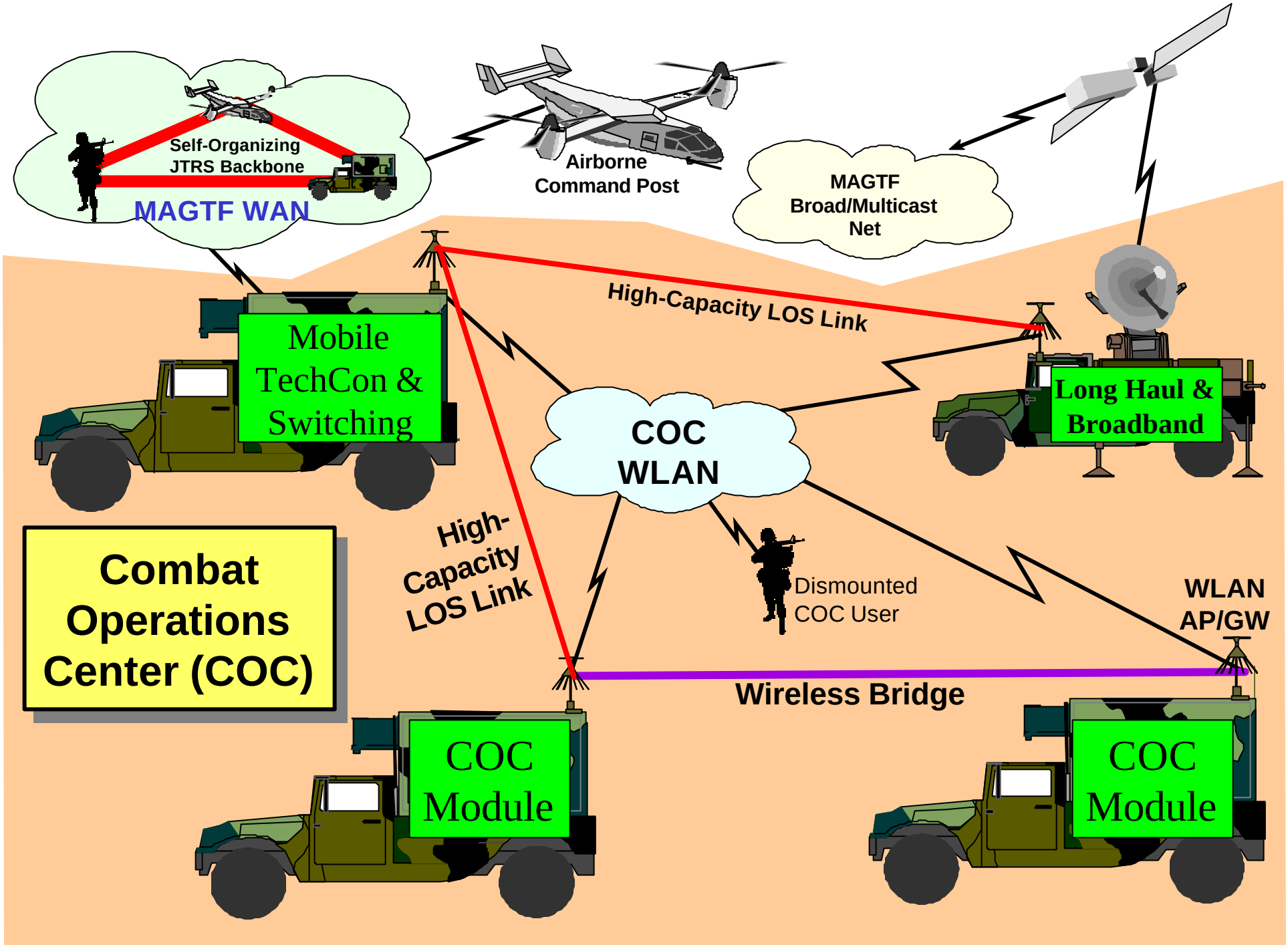
Design Goals

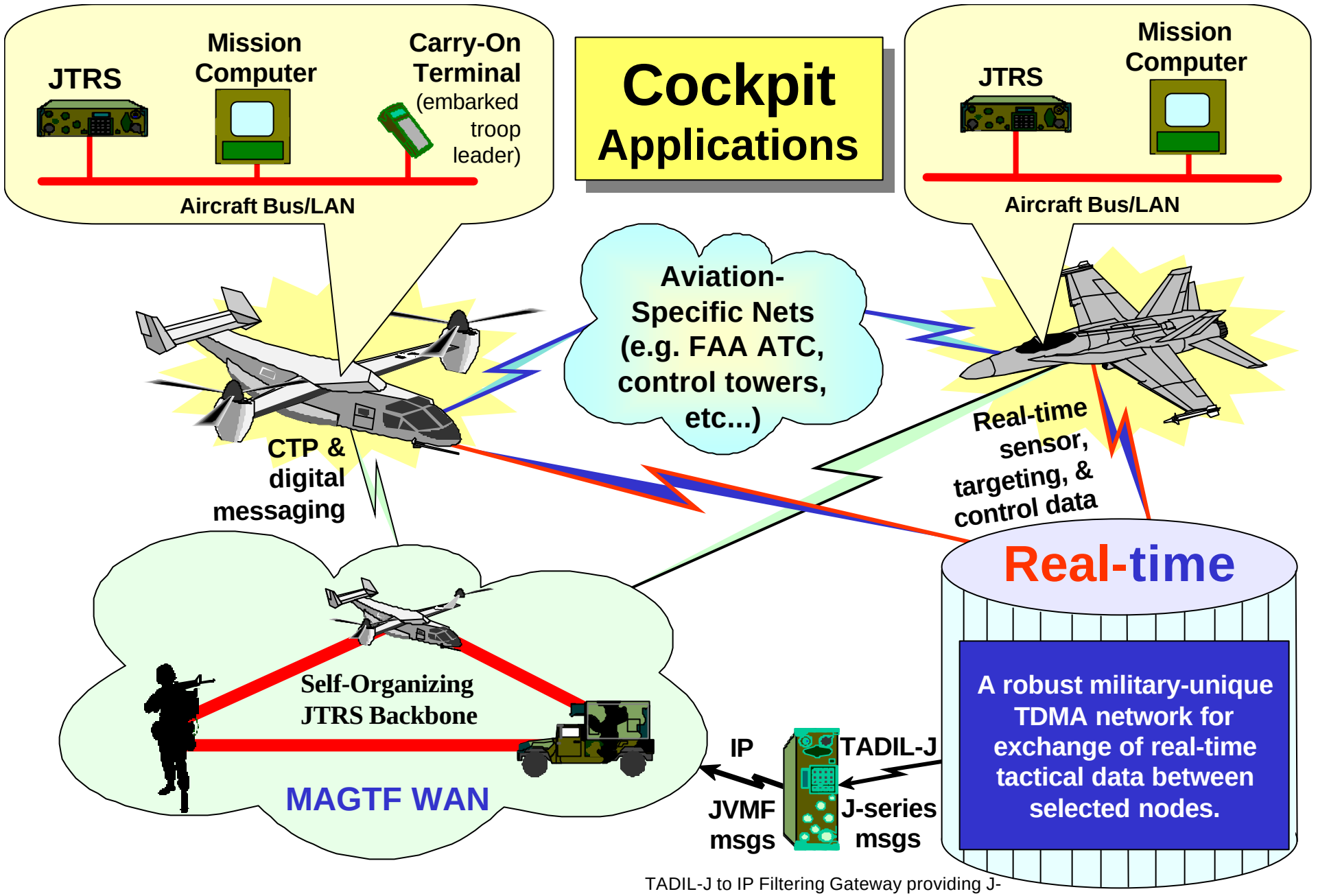
- Connectivity On-the-Move & Beyond Line-of-sight
- Reduced weight & bulk
- Easier to…
  - Set Up
  - Operate
  - Maintain



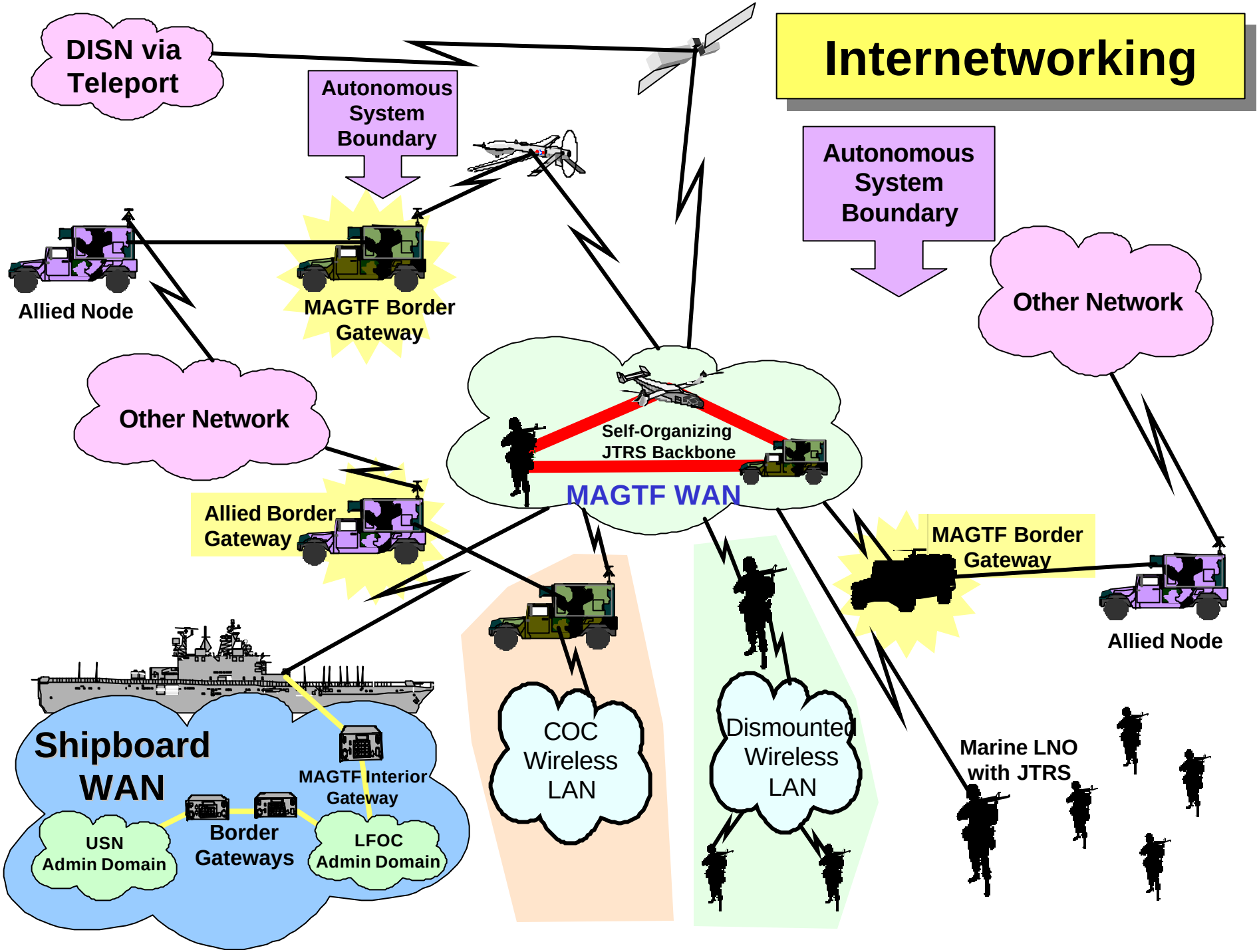

MAGTF
Broad/Multicast
Service
Satellite-Based
Relay and
Personal
Communications
Services
Airborne Relay
LPI
LPD
Link
Deep
Recon
Team
Self-Organizing
JTRS Backbone
MAGTF Wide
Area Network (WAN)
Alternate
Access Point /
Gateway
Wireless
LAN
Access Point /
Gateway
Wireless
LAN
Access Point /
Gateway
COC
Wireless
LAN


Alternative
Access Point/Gateway
& JTRS Cluster Head
Self-Organizing
JTRS Backbone
MAGTF WAN
Dismounted
Mobile
Environment
Dismounted
Mobile
Wireless
Local Area Network
(WLAN)
Dismounted Access
Point/Gateway
Dismounted
End-User
Terminal
Dismounted
End-User
Terminal

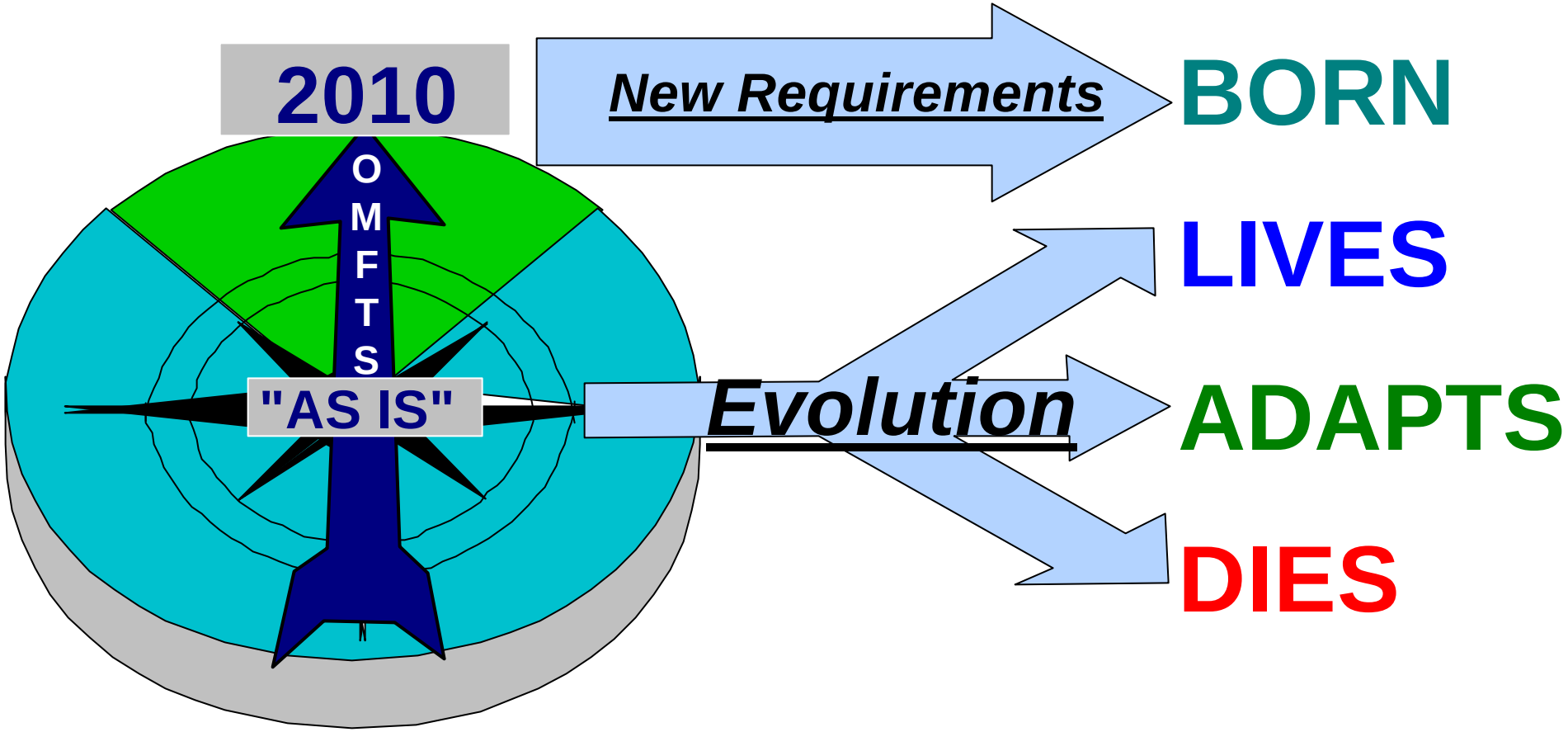

Self-Organizing
JTRS Backbone
MAGTF WAN
Airborne
Command Post
MAGTF
Broad/Multicast
Net
High-Capacity LOS Link
Mobile
TechCon &
Switching
Long Haul &
Broadband
COC
WLAN
Combat
Operations
Center (COC)
High-
Capacity
LOS Link
Dismounted
COC User
WLAN
AP/GW
Wireless Bridge
COC
Module
COC
Module



TADIL-J to IP Filtering Gateway providing J-Series to JVMF translation & forwarding of selected messages (e.g. air picture for CTP)


Internetworking
DISN via Teleport
Autonomous System Boundary
Autonomous System Boundary
Allied Node
MAGTF Border Gateway
Other Network
Other Network
Self-Organizing JTRS Backbone
MAGTF WAN
Allied Border Gateway
MAGTF Border Gateway
Allied Node
Shipboard WAN
MAGTF Interior Gateway
USN Admin Domain
Border Gateways
LFOC Admin Domain
COC Wireless LAN
Dismounted Wireless LAN
Marine LNO with JTRS

Transition


2010
O
M
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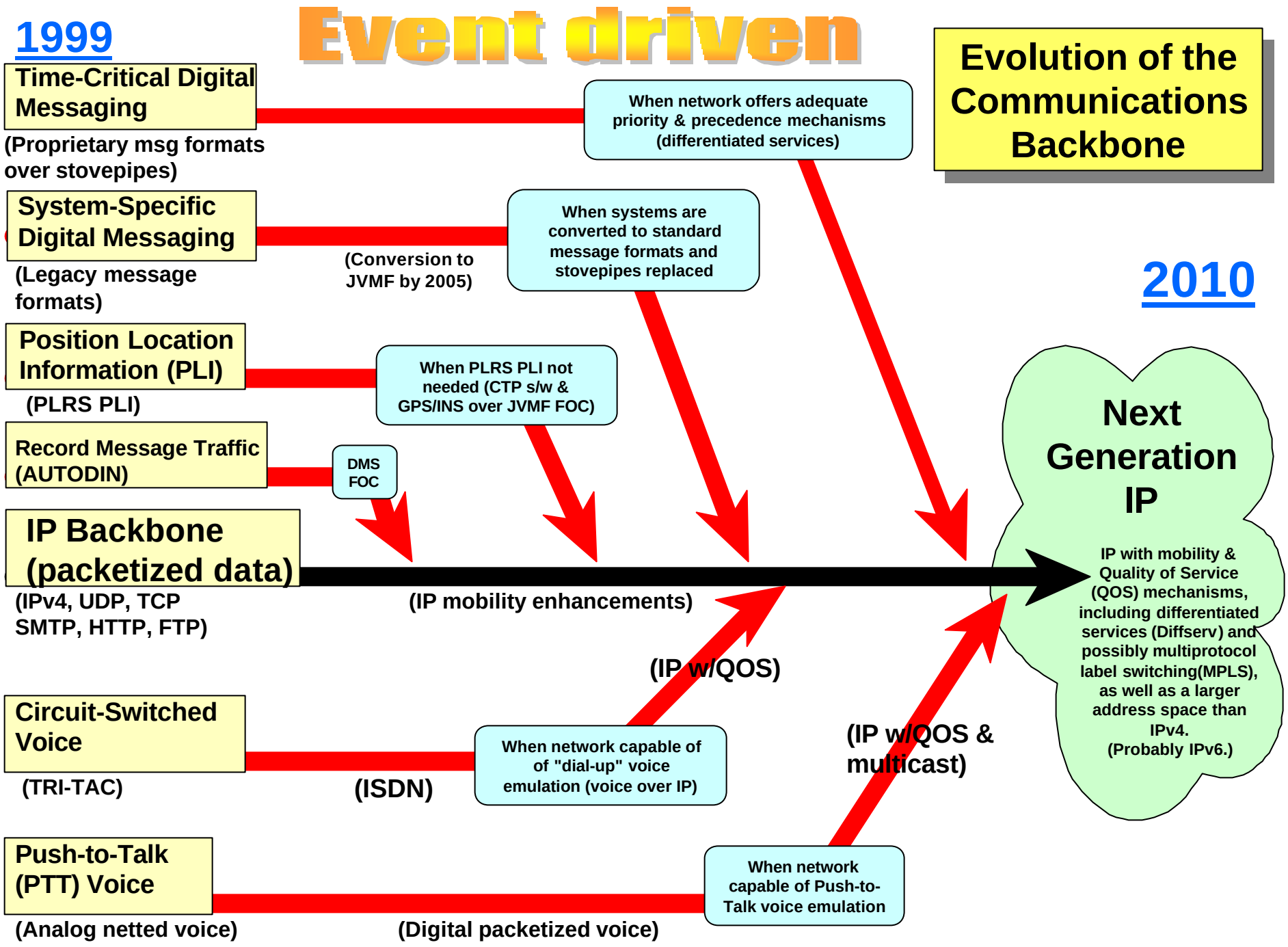
S
"AS IS"
New Requirements
Evolution
BORN
LIVES
ADAPTS
DIES


1999
Event driven
Evolution of the Communications Backbone
Time-Critical Digital Messaging
(Proprietary msg formats over stovepipes)
When network offers adequate priority & precedence mechanisms (differentiated services)
System-Specific Digital Messaging
(Legacy message formats)
(Conversion to JVMF by 2005)
When systems are converted to standard message formats and stovepipes replaced
2010
Position Location Information (PLI)
(PLRS PLI)
When PLRS PLI not needed (CTP s/w & GPS/INS over JVMF FOC)
Record Message Traffic (AUTODIN)
DMS FOC
IP Backbone (packetized data)
(IPv4, UDP, TCP SMTP, HTTP, FTP)
(IP mobility enhancements)
Next Generation IP
IP with mobility & Quality of Service (QOS) mechanisms, including differentiated services (Diffserv) and possibly multiprotocol label switching(MPLS), as well as a larger address space than IPv4.
(Probably IPv6.)
(IP w/QOS)
Circuit-Switched Voice
(TRI-TAC)
(ISDN)
When network capable of of "dial-up" voice emulation (voice over IP)
(IP w/QOS & multicast)
Push-to-Talk (PTT) Voice
(Analog netted voice)
(Digital packetized voice)
When network capable of Push-to-Talk voice emulation

USMC C4I Architecture Home Page

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Near-Term (0-5 years) Systems Architecture Diagrams - Hierarchical diagrams of "AS-IS" systems architectures, including systems that are currently fielded or "under construction." Although predominantly consisting of diagrams of Marine Corps organizations, this section also includes diagrams of selected organizations external to the Marine Corps (from a Marine Corps perspective). Many objects in these diagrams are actually links to other diagrams. Pass your mouse cursor over systems or organizations and your browser will usually give you some indication that a link is hidden there. Clicking on an organization or OpFac will then lead to a more detailed view of that organization or OpFac. Clicking on a system icon will bring up a web page describing the system.

- **Long-Term (5-10 years) Systems Architecture Diagrams** - Hierarchical diagrams of "TO-BE" systems architectures. These architecture depictions are used to synchronize the efforts of requirements drafters, system builders, experimenters, and researchers. Again, click on icons to see any sub-diagrams offering additional detail.

- **Operational Architecture Diagrams** - Hierarchical diagrams of the Operational Architecture for the Marine Expeditionary Force (MEF). Click on an operational facility (OpFac) for data describing that OpFac, its needlines, or information exchange requirements (IERs).

- **Regimental Communications Model** - This diagram set depicts one possible systems architecture for the Ground Combat Element (GCE) of a MEF Forward. This particular task organization and scenario was selected for use in an ongoing communications modeling and simulation effort. In particular, this model will be used to explore several EPLRS employment options.